Nokia Customer Care

Service Manual

RM-443 (Nokia 6303 classic; L3&4)
Mobile Terminal

Part No: (Issue 2)

COMPANY CONFIDENTIAL

Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	03/2009	ET	
Issue 2	03/2009	ET	New attenuation values have been added to the *SA-138 RF coupler* section in the *Service Devices and Service Concepts* chapter (page 2-6). The *Checking antenna functionality* section has been updated in the *RF Troubleshooting* chapter (pages 4-16 to 4-18).

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IMPORTANT

This document is intended for use by qualified service personnel only.

Warnings and cautions

Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/ MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.
- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

Cautions

- Servicing and alignment must be undertaken by qualified personnel only.
- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
- Use only approved components as specified in the parts list.
- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.
- Ensure all cables and wires are repositioned correctly.
- During testing never activate the GSM transmitter without a proper antenna load, otherwise the GSM PA may be damaged.

For your safety

QUALIFIED SERVICE

Only qualified personnel may install or repair phone equipment.

ACCESSORIES AND BATTERIES

Use only approved accessories and batteries. Do not connect incompatible products.

CONNECTING TO OTHER DEVICES

When connecting to any other device, read its user’s guide for detailed safety instructions. Do not connect incompatible products.

Care and maintenance

This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfil any warranty obligations and to enjoy this product for many years.

- Keep the phone and all its parts and accessories out of the reach of small children.
- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.
- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.
- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, battery, charger or any accessory.

ESD protection

Nokia requires that service points have sufficient ESD protection (against static electricity) when servicing the phone.

Any product of which the covers are removed must be handled with ESD protection. The SIM card can be replaced without ESD protection if the product is otherwise ready for use.

To replace the covers ESD protection must be applied.

All electronic parts of the product are susceptible to ESD. Resistors, too, can be damaged by static electricity discharge.

All ESD sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD protected spare part packages MUST NOT be opened/closed out of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Nokia After Market Services representative.

Battery information

Note: A new battery's full performance is achieved only after two or three complete charge and discharge cycles!

The battery can be charged and discharged hundreds of times but it will eventually wear out. When the operating time (talk-time and standby time) is noticeably shorter than normal, it is time to buy a new battery.

Use only batteries approved by the phone manufacturer and recharge the battery only with the chargers approved by the manufacturer. Unplug the charger when not in use. Do not leave the battery connected to a charger for longer than a week, since overcharging may shorten its lifetime. If left unused a fully charged battery will discharge itself over time.

Temperature extremes can affect the ability of your battery to charge.

For good operation times with Li-Ion batteries, discharge the battery from time to time by leaving the product switched on until it turns itself off (or by using the battery discharge facility of any approved accessory available for the product). Do not attempt to discharge the battery by any other means.

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

Do not short-circuit the battery. Accidental short-circuiting can occur when a metallic object (coin, clip or pen) causes direct connection of the + and - terminals of the battery (metal strips on the battery) for example when you carry a spare battery in your pocket or purse. Short-circuiting the terminals may damage the battery or the connecting object.

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. Always try to keep the battery between 15°C and 25°C (59°F and 77°F). A phone with a hot or cold battery may temporarily not work, even when the battery is fully charged. Batteries' performance is particularly limited in temperatures well below freezing.

Do not dispose of batteries in a fire!

Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

Company policy

Our policy is of continuous development; details of all technical modifications will be included with service bulletins.

While every endeavour has been made to ensure the accuracy of this document, some errors may exist. If any errors are found by the reader, NOKIA MOBILE PHONES Business Group should be notified in writing/e-mail.

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- Title of the Document + Issue Number/Date of publication
- Latest Amendment Number (if applicable)
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Nokia 6303 classic; L3&4 Service Manual Structure

1 General information
2 Service Devices and Service Concepts
3 BB Troubleshooting and Manual Tuning Guide
4 RF Troubleshooting
5 System Module and User Interface
Glossary

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1 — General information

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Product selection

RM-443 (Nokia 6303 classic) is a GSM triband handportable phone, supporting EGSM 900/1800/1900 bands and GPRS/EGPRS data bearers.

For GPRS/EGPRS networks RM-443 is a Class B EGPRS MSC 32 (5 Rx + 3 Tx, max sum 6), which means a maximum downlink speed of 296 kbit/s and uplink speed of 177.6 kbit/s. RM-443 also supports Dual Transfer Mode (DTM) for simultaneous voice and packet data connection in GSM/EDGE networks; simple class A, multi slot class 11, (4 Rx + 3 Tx, max sum 5), downlink speed of 177.6 kbit/s and uplink speed of 118.4 kbit/s.

RM-443 is an MMS (Multimedia Messaging Service) enabled multimedia device. The MMS implementation follows the OMA MMS standard release 1.3. RM-443 also supports Bluetooth 2.1 standard with the stereo audio profiles.

RM-443 has a large 2.2’’ QVGA (320 x 240 pixels) TFT main display with 16 million colors. The device also has a 3.2 Megapixel camera with dual LED flash and 8 x digital zoom.

RM-443 supports the 3rd generation S40 UI and S40 OSS web browser, which brings desktop-like Web browsing experience to mobile devices.

RM-443 also supports MIDP Java 2.0, providing a good platform for compelling 3rd party applications.

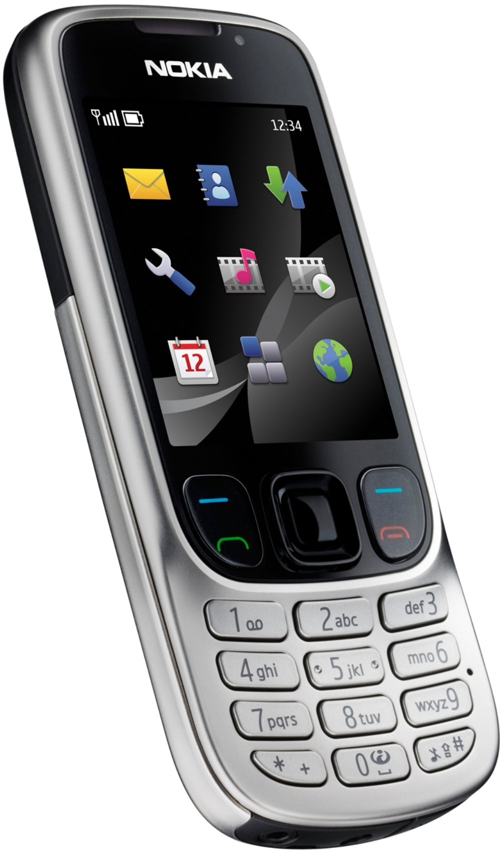

Figure 1 View of RM-443

Product features and sales package

Bearers and transport

- GSM/EDGE Class B, Multi slot class 32
- GPRS/EGPRS Class B, Multi slot class 32
- GSM/EDGE Dual Transfer Mode (DTM) class A, multi slot class 11

- DARP (SAIC version 2)

Connectivity

- Bluetooth 2.1 with stereo audio profiles
- USB2.0 Full Speed with micro USB interface
- MicroSD memory card - support up to 4GB (hotswap)
- 3.5 mm AV Connector
- 2 mm DC charger plug

Display

- Large 2.2’’ QVGA (320x240 pixels) TFT display with 16 million colors

Imaging and video

- Integrated 3.2 Megapixel camera with dual LED flash, NIPS and smooth 8 x digital zoom
- Video recording in VGA, CIF, QCIF and subQCIF (15fps)
- Video player with 3GPP H.263 playback and streaming, recording and MPEG4 playback

Music

- Music Player supporting MP3, MP4, AAC, AAC+, enhanced AAC+, H.263, H.264
- Ring tones: Video, WAV, MP3, AAC, eAAC+ and 64 polyphonic ringing tones
- FM stereo radio

Productivity

Context management

- OMA DRM version 2.0
- Organizer (Calendar + To-Do + Active Notes)
- PC Suite
- Active Standby
- Local/remote SyncML data sync
- Web Browser (OSS), Java ™ MIDP 2.0, XHTML browsing over TCP/IP

Messaging

- Email: Max. message size is 600 kB (sending & receiving)
- OMA MMS 1.3 (600kB MMS size)
- Audio Messaging (AMS)
- Instant Messaging

Voice

- Speech codec support for HR, FR, EFR and AMR

Add-on software framework

- Nokia Series 40, 3rd edition
- Java: MIDP2.0

Additional features

- Macromedia Flash Lite 3.0

- Vibrating alert
- Reminder light
- Nokia Maps 1.2 support

Sales package

- Transceiver RM-443
- Battery (BL-5CT/1050 mAh)
- Nokia Charger: AC-8
  (AC-6 and CA-100C for China)
- Nokia wired stereo headset (WH-102)
- 1GB MicroSD card including Nokia Maps
- USB data cable (CA-101D)
- User Guide

Product and module list

Module name	Type code	Notes
Main PWB	2YF	
Flash PWB	2AH	

Mobile enhancements

Table 1 Audio

Enhancement	Type
Audio Adapter (2.5 to 3.5mm)	AD-52
Wired headsets	HS-16
	HS-41
	HS-44 (+ AD-45)
	HS-45 (+ AD-54)
	HS-48
	WH-201
	WH-500
	WH-600
	WH-700
	WH-800

Enhancement	Type
Wireless headsets	BH-101
	BH-102
	BH-103
	BH-104
	BH-200
	BH-201
	BH-202
	BH-208
	BH-212
	BH-213
	BH-215
	BH-301
	BH-501
	BH-504
	BH-600
	BH-602
	BH-604
	BH-606
	BH-700
	BH-703
	BH-800
	BH-803
	BH-804
	BH-900
	BH-902
	BH-903
	BH-904

Table 2 Car

Enhancement	Type
Car installation kit	CK-100
	CK-300
	CK-600
	CK-7W
	CK-15W

Enhancement	Type
Nokia 500 Auto Navigation	PD-14
Universal holder	CR-39
	CR-82
	CR-99
	HH-12
	HH-17
Wireless plug-in car handsfree	HF-33W
	HF-200
	HF-300
	HF-310
	HF-510

Table 3 Data

Enhancement	Type
MicroSD card, 256MB	MU-27
MicroSD card, 512 MB	MU-28
MicroSD card, 1 GB	MU-22
MicroSD card, 2 GB	MU-37
MicroSD card, 4 GB	MU-41
MicroSD card, 8 GB	MU-43
MicroUSB connectivity adapter cable	CA-101, CA-101D
Wireless GPS Module	LD-4W

Table 4 Music

Enhancement	Type
Wired music speakers	MD-4
	MD-6
	MD-8
Wireless music speakers	MD-5W
	MD-7W

Table 5 Power

Enhancement	Type
This phone is charged through the smaller charger Nokia standard interface (2.mm plug). The standard 3.5mm standard charger can be used together with the CA-44 charger adapter.	
Battery 1050 mAh Li-Ion	BL-5CT
First aid charger	DC-8
Mobile charger	DC-4
	DC-9
	DC-11
Travel charger	AC-4
	AC-5
	AC-8
USB charger	AC-6C
USB Charger Adapter Cable	CA-100
	CA-100C
	CA-126
Charger adapter	CA-44

Technical specifications

General specifications

Unit	Dimension (mm)	Weight (g)	Volume (cc)
Transceiver with BL-5CT 1050 mAh Li-Ion battery pack	108.8 x 46.2 x 12.9	96	57

Battery endurance

Battery	Talk time	Stand-by time
BL-5CT 1050 mAh Li-ion	Up to 7 hours	Up to 18 days

Note: Variation in operation times will occur depending on SIM card, network settings and usage.

Main RF characteristics for GSM900/1800/1900 (triband) and EDGE phones

Table 6 Main RF characteristics

Parameter	Unit
Cellular system	EGSM900, GSM1800/1900 and EDGE

Parameter	Unit
Rx frequency band	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
Tx frequency band	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
Output power	GSM900: +5 ... +33dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
EDGE output power	EDGE900: +5 ... +29dBm/3.2mW ... 794mW
	EDGE1800: +0 ... +26dBm/1.0mW ... 400mW
	EDGE1900:+0 ... +26dBm/1.0mW ... 400mW
Number of RF channels	GSM900: 194
	GSM1800: 374
	GSM1900: 299
Channel spacing	200 kHz
Number of Tx power levels	GSM900: 15
	GSM1800: 16
	GSM1900: 16
Number of EDGE Tx power levels	GSM900 EDGE: 12
	GSM1800 EDGE: 14
	GSM1900 EDGE: 14

Environmental conditions

Temperature conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-15ºC...+55ºC	Specifications fulfilled
Reduced performance	-25ºC...-15ºC +55ºC...+70ºC	Operational for shorts periods only
Intermittent operation	-40ºC...-15ºC +70ºC...+85 ºC	Operation not guaranteed but an attempt to operate does not damage the phone.
No operation or storage	<-40ºC...>+85ºC	No storage or operation: an attempt may damage the phone.
Charging allowed	-25ºC...+50ºC	

Environmental condition	Ambient temperature	Notes
Long term storage conditions	0ºC...+85ºC	

Humidity

Relative humidity range is 5...95%.

The HW module is not protected against water. Condensed or splashed water might cause malfunction. Any submerge of the phone will cause permanent damage. Long-term high humidity, with condensation, will cause permanent damage because of corrosion.

Vibration

The module should withstand the following vibrations:

- 5 - 10 Hz; +10dB / octave
- 10 - 50 Hz; 5.58 m^2 / s^3 (0.0558 g^2/ Hz)
- 50 - 300 Hz; - 10 dB / octave

ESD strength

Conducted discharge is 8 kV (>10 discharges) and air contact 15 kV (>10 discharges).

The standard for electrostatic discharge is IEC 61000-4-2, and this device fulfils level 4 requirements.

RoHS

This device uses RoHS compliant components and lead-free soldering process.

2 — Service Devices and Service Concepts

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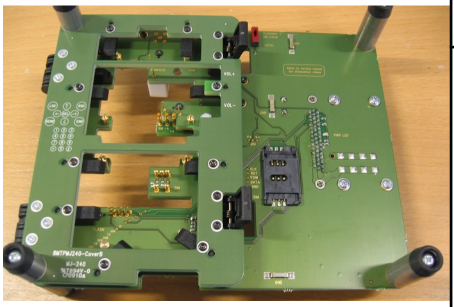
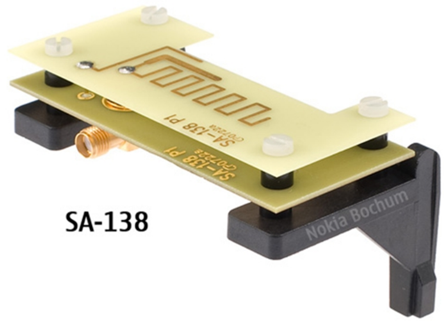
Service devices

Product specific devices

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-443. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

PKC GROUP PROTO NOKIA FS-121 proto v. 0.2 Local CU-4 Local S-46 Flash & EM Calib.	FS-121	Flash adapter	
	• FS-121 is equipped with a clip interlock system • Provides standardised interface towards Control Unit • Provides RF connection using coupler • Multiplexing between USB and FBUS media, controlled by VUSB		
	MJ-240	Module jig	
	MJ-240 is meant for component level troubleshooting. The jig includes an RF interface for GSM and Bluetooth. In addition, it has the following features: • Provides mechanical interface with the engine module • Provides galvanic connection to all needed test pads in module • Multiplexing between USB and FBUS media, controlled by Vusb • MMC interface • Duplicated SIM connector • Connector for control unit • Access for AV- and USB connectors		
RJ-230 Nokia Bochum	RJ-230	Soldering jig	
	RJ-230 is a soldering jig used for soldering and as a rework jig for the engine module.		



SA-138	RF coupler	

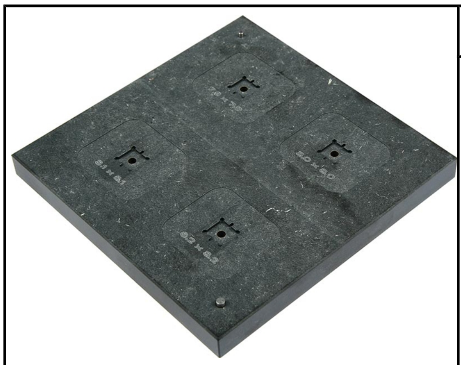
SA-138 is an RF coupler for GSM RF testing. It is used together with SS-46 and SS-62.

The following table shows attenuations from the antenna pads of the mobile terminal to the SMA connectors of SA-138:

Attenuation values for inductive RF coupler SA-138			
Band	**Channel**	**Attenuation RX**	**Attenuation TX**
GSM 900	Low	2	2,9
	Mid	3	2,5
	High	4	2,4
GSM 1800	Low	5	4,6
	Mid	5	4,8
	High	5	5,2
GSM 1900	Low	6	6,1
	Mid	7	6,6
	High	8	6,5

Rework jigs and stencils

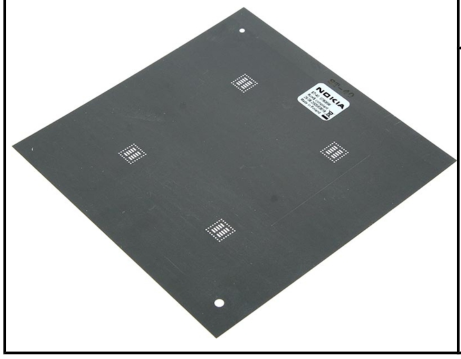
The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-443. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.



RJ-184	Rework jig	

RJ-184 is a rework jig used when servicing the microphone (B2150).

It is used together with the ST-61 rework stencil.



ST-61	Rework stencil	

ST-61 is a rework stencil used when servicing the microphone (B2150).

It is used together with the rework jig RJ-184.

General devices

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-443. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

<table>
<tr><td rowspan="2"> </td><td>AC-33</td><td>Power supply</td><td></td></tr>
<tr><td colspan="3">Universal power supply for FPS-10; included in the FPS-10 sales package.</td></tr>
<tr><td rowspan="2"> </td><td>AC-35</td><td>Power supply</td><td></td></tr>
<tr><td colspan="3">Universal power supply for FPS-21; included in the FPS-21 sales package.
Input 100V...230V 50Hz...60Hz, output voltage of 12 V and output current up to 3 A.</td></tr>
<tr><td rowspan="2">

NOKIA
0680032
ACF-8
ACF-8

</td><td>ACF-8</td><td>Universal power supply</td><td></td></tr>
<tr><td colspan="3">The ACF-8 universal power supply is used to power FLS-5.</td></tr>
</table>

CU-4

CU-4	Control unit	

CU-4 is a general service tool used with a module jig and/or a flash adapter. It requires an external 12 V power supply.

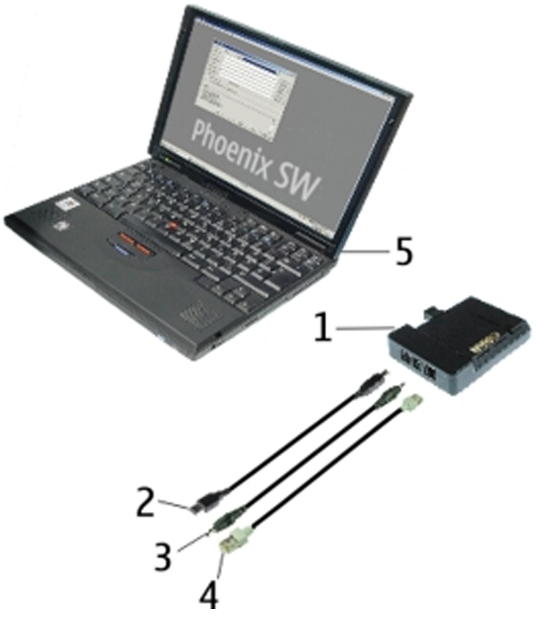
The unit has the following features:

- software controlled via USB
- EM calibration function
- Forwards FBUS/Flashbus traffic to/from terminal
- Forwards USB traffic to/from terminal
- software controlled BSI values
- regulated VBATT voltage
- 2 x USB2.0 connector (Hub)
- FBUS and USB connections supported

When using CU-4, note the special order of connecting cables and other service equipment:

Instructions

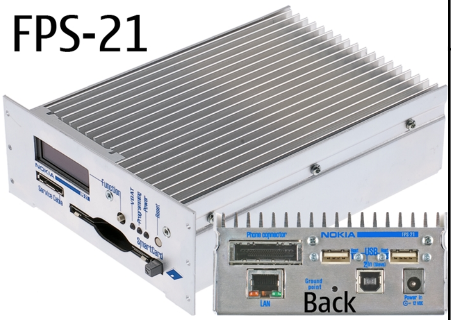
1. Connect a service tool (jig, flash adapter) to CU-4.
2. Connect CU-4 to your PC with a USB cable.
3. Connect supply voltage (12 V)
4. Connect an FBUS cable (if necessary).
5. Start Phoenix service software.



Note: Phoenix enables CU-4 regulators via USB when it is started.

Reconnecting the power supply requires a Phoenix restart.

<table>
<tr>
<td rowspan="2"> </td>
<td>FLS-5</td>
<td>Flash device</td>
<td></td>
</tr>
<tr>
<td colspan="3">FLS-5 is a dongle and flash device incorporated into one package, developed specifically for POS use.
Note: FLS-5 can be used as an alternative to PKD-1.</td>
</tr>
<tr>
<td rowspan="2"> </td>
<td>FPS-10</td>
<td>Flash prommer</td>
<td></td>
</tr>
<tr>
<td colspan="3">FPS-10 interfaces with:
• PC
• Control unit
• Flash adapter
• Smart card
FPS-10 flash prommer features:
• Flash functionality for BB5 and DCT-4 terminals
• Smart Card reader for SX-2 or SX-4
• USB traffic forwarding
• USB to FBUS/Flashbus conversion
• LAN to FBUS/Flashbus and USB conversion
• Vusb output switchable by PC command
FPS-10 sales package includes:
• FPS-10 prommer
• Power Supply with 5 country specific cords
• USB cable
Note: FPS-21 is substitute FPS-10 if FPS-10 has not been set up.</td>
</tr>
</table>



FPS-21	Flash prommer	

FPS-21 sales package:

- FPS-21 prommer
- AC-35 power supply
- CA-31D USB cable

FPS-21 interfaces:

Front

- Service cable connector

  Provides Flashbus, USB and VBAT connections to a mobile device.
- SmartCard socket

  A SmartCard is needed to allow DCT-4 generation mobile device programming.

Rear

- DC power input

  For connecting the external power supply (AC-35).
- Two USB A type ports (USB1/USB3)

  Can be used, for example, for connecting external storage memory devices or mobile devices
- One USB B type device connector (USB2)

  For connecting a PC.
- Phone connector

  Service cable connection for connecting Flashbus/FLA.
- Ethernet RJ45 type socket (LAN)

  For connecting the FPS-21 to LAN.

Inside

- Four SD card memory slots

  For internal storage memory.

  Note: In order to access the SD memory card slots inside FPS-21, the prommer needs to be opened by removing the front panel, rear panel and heatsink from the prommer body.

  Note: FPS-10 can be used for flashing instead of FPS-21 if necessary.

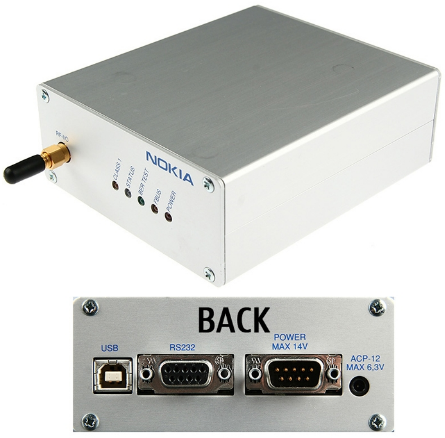
DESkey
www.des.co.uk

PK-1	Software protection key	

PK-1 is a hardware protection key with a USB interface. It has the same functionality as the PKD-1 series dongle.

PK-1 is meant for use with a PC that does not have a series interface.

To use this USB dongle for security service functions please register the dongle in the same way as the PKD-1 series dongle.

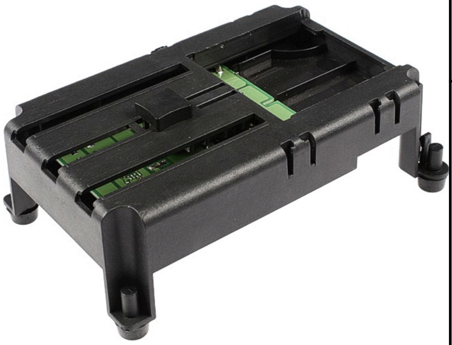
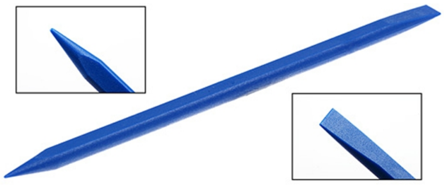
<table>
<tr><td rowspan="2"> </td><td>PKD-1</td><td>SW security device</td><td></td></tr>
<tr><td colspan="3">SW security device is a piece of hardware enabling the use of the service software when connected to the parallel (LPT) port of the PC.
Without the device, it is not possible to use the service software.
Printer or any such device can be connected to the PC through the device if needed.</td></tr>
<tr><td rowspan="2"> </td><td>SB-6</td><td>Bluetooth test and interface box (sales package)</td><td></td></tr>
<tr><td colspan="3">The SB-6 test box is a generic service device used to perform Bluetooth bit error rate (BER) testing, and establishing cordless FBUS connection via Bluetooth. An ACP-8x charger is needed for BER testing and an AXS-4 cable in case of cordless interface usage testing .
Sales package includes:
• SB-6 test box
• Installation and warranty information</td></tr>
<tr><td rowspan="2">

NOKIA
SPS-1 0770381
MADE IN FINLAND

</td><td>SPS-1</td><td>Soldering Paste Spreader</td><td></td></tr>
<tr><td colspan="3">The SPS-1 allows spreading of solder to the LGA components pads over the rework stencils.
Note: Existing solder paste stencils and component holder jigs will be supported until January 2009. For all new parts needing solder paste support after January 1, 2009, please contact your solder machine manufacturer for the universal solutions for solder paste application for rework purposes.</td></tr>
<tr><td rowspan="2">

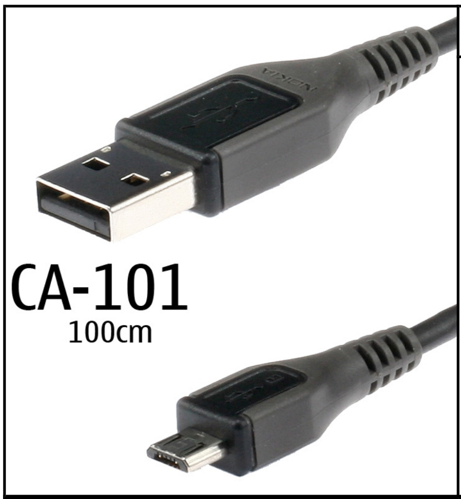
NOKIA
SPS-2 0770471
Made in Finland

</td><td>SPS-2</td><td>Soldering paste spreader</td><td></td></tr>
<tr><td colspan="3">Note: Existing solder paste stencils and component holder jigs will be supported until January 2009. For all new parts needing solder paste support after January 1, 2009, please contact your solder machine manufacturer for the universal solutions for solder paste application for rework purposes.</td></tr>
</table>

	SRT-6	Opening tool	
	SRT-6 is used to open phone covers. **Note:** The SRT-6 is included in the Nokia Standard Toolkit.		
SS-46 	SS-46	Interface adapter	
	SS-46 acts as an interface adapter between the flash adapter and FPS-10.		
	SS-62	Generic flash adapter base for BB5	
	• generic base for flash adapters and couplers • SS-62 equipped with a clip interlock system • provides standardised interface towards Control Unit • provides RF connection using galvanic connector or coupler • multiplexing between USB and FBUS media, controlled by VUSB		
	SS-93	Opening tool	
	SS-93 is used for opening JAE connectors. **Note:** The SS-93 is included in Nokia Standard Toolkit.		
SX-4 	SX-4	Smart card	
	SX-4 is a BB5 security device used to protect critical features in tuning and testing. SX-4 is also needed together with FPS-10 when DCT-4 phones are flashed.		

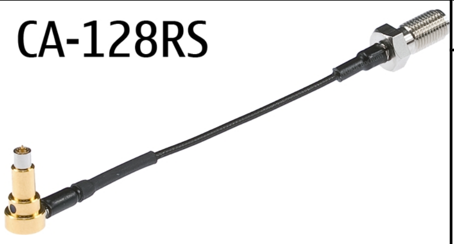
Cables

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-443. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.



CA-101	Micro USB cable	

The CA-101 is a USB-to-microUSB data cable that allows connections between the PC and the phone.



CA-128RS	RF tuning cable	

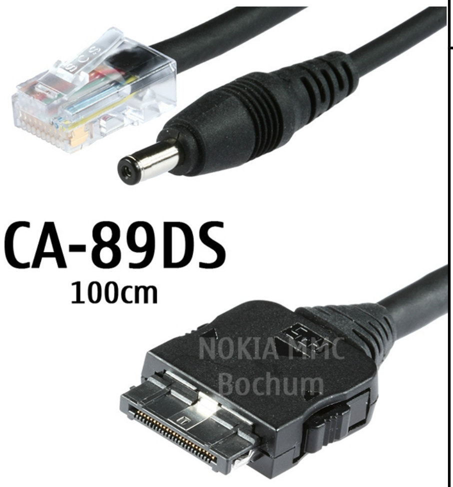
Product-specific adapter cable for RF tuning.

- **Table 7 Attenuation values**

Band	Attenuation Rx
GSM850/900	0.30 dB
GSM1800	0.40 dB
GSM1900	0.45 dB
WLAN 2.4GHz	0.40 dB

CA-31D	USB cable	

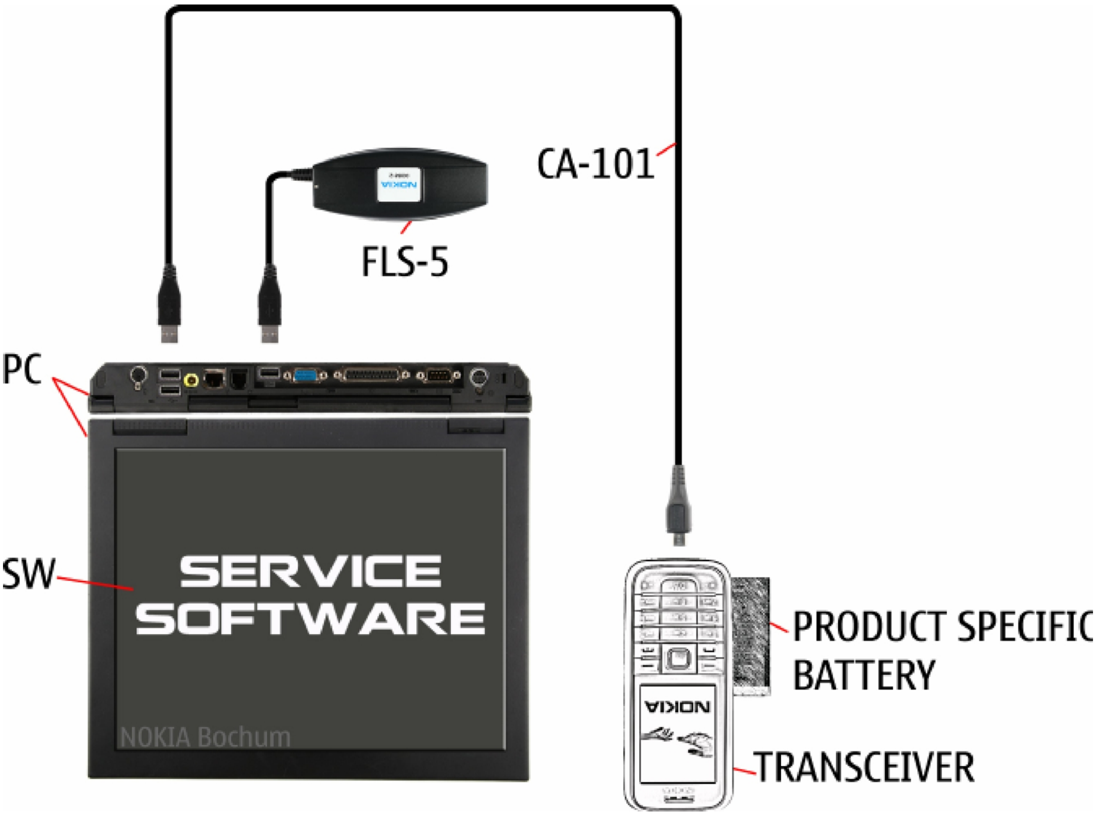
The CA-31D USB cable is used to connect FPS-10 or FPS-11 to a PC. It is included in the FPS-10 and FPS-11 sales packages.

<table>
<tr><td rowspan="2"> </td><td>CA-35S</td><td>Power cable</td><td></td></tr>
<tr><td colspan="3">CA-35S is a power cable for connecting, for example, the FPS-10 flash prommer to the Point-Of-Sales (POS) flash adapter.</td></tr>
<tr><td rowspan="2"> </td><td>CA-89DS</td><td>Cable</td><td></td></tr>
<tr><td colspan="3">Provides VBAT and Flashbus connections to mobile device programming adapters.</td></tr>
<tr><td rowspan="2"> </td><td>DAU-9S</td><td>MBUS cable</td><td></td></tr>
<tr><td colspan="3">The MBUS cable DAU-9S has a modular connector and is used, for example, between the PC's serial port and module jigs, flash adapters or docking station adapters.
Note: Docking station adapters valid for DCT4 products.</td></tr>
</table>

<table>
<tr><td rowspan="2"> </td><td>PCS-1</td><td>Power cable</td><td></td></tr>
<tr><td colspan="3">The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled voltage.</td></tr>
<tr><td rowspan="2"> </td><td>XCS-4</td><td>Modular cable</td><td></td></tr>
<tr><td colspan="3">XCS-4 is a shielded (one specially shielded conductor) modular cable for flashing and service purposes.</td></tr>
<tr><td rowspan="2"> </td><td>XRS-6</td><td>RF cable</td><td></td></tr>
<tr><td colspan="3">The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment.
SMA to N-Connector approximately 610 mm.
Attenuation for:
• GSM850/900: 0.3+-0.1 dB
• GSM1800/1900: 0.5+-0.1 dB
• WLAN: 0.6+-0.1dB</td></tr>
</table>

Service concepts

POS (Point of Sale) flash concept


CA-101
FLS-5
PC
SW
SERVICE SOFTWARE
NOKIA Bochum
PRODUCT SPECIFIC BATTERY
TRANSCEIVER

Type	Description
Product specific tools	
BL-5CT	Battery
Other tools	
FLS-5	POS flash dongle
	PC with Phoenix service software
Cables	
CA-101	Micro USB cable

Flash concept with FPS-10

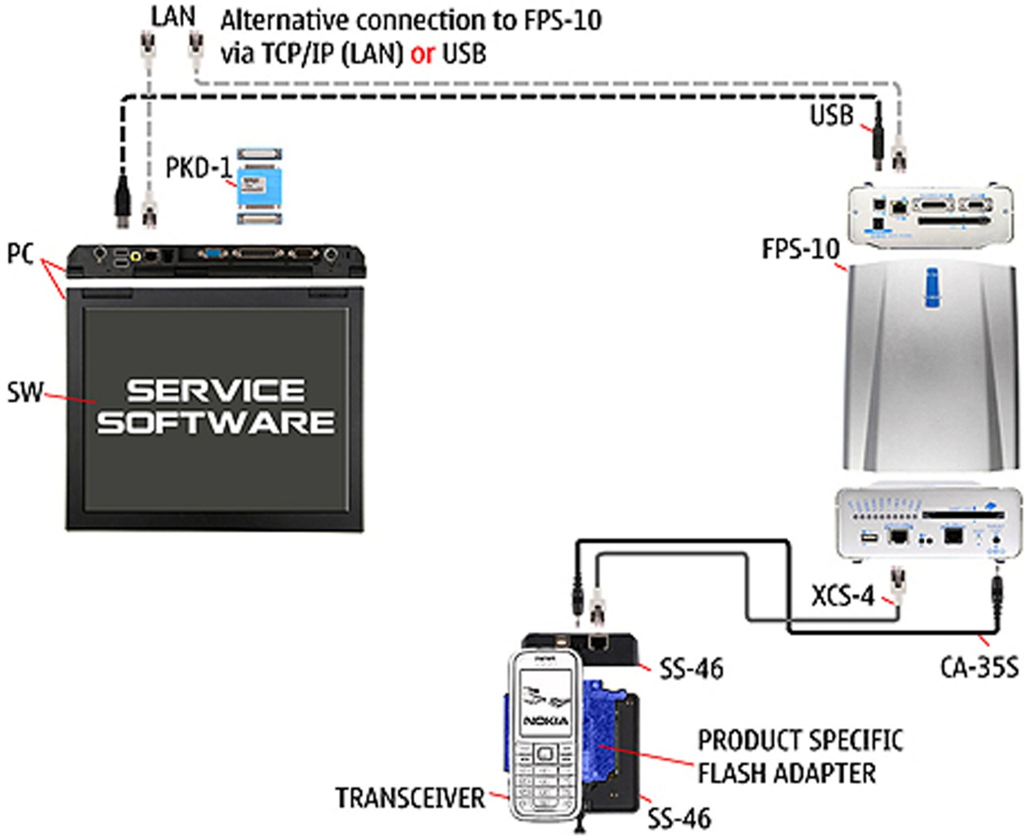

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
USB
PKD-1
PC
SW
SERVICE
SOFTWARE
FPS-10
XCS-4
SS-46
CA-35S
PRODUCT SPECIFIC
FLASH ADAPTER
TRANSCEIVER
SS-46

Figure 2 Basic flash concept with FPS-10

Type	Description
Product specific devices	
FS-121	Flash adapter
Other devices	
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-46	Interface adapter
	PC with Phoenix service software
Cables	
XCS-4	Modular cable
CA-35S	Power cable
	USB cable

Flash concept with FPS-21

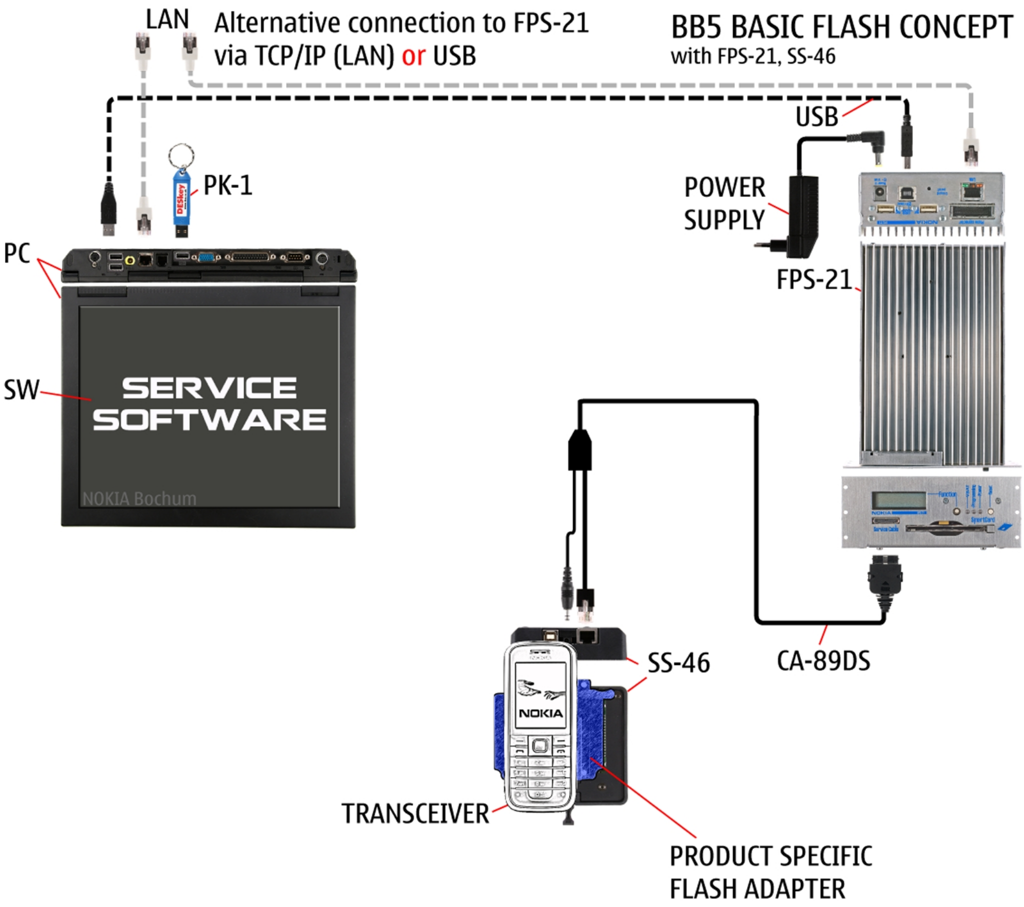

LAN
Alternative connection to FPS-21
via TCP/IP (LAN) or USB
BB5 BASIC FLASH CONCEPT
with FPS-21, SS-46
USB
POWER
SUPPLY
PK-1
PC
FPS-21
SW
SERVICE
SOFTWARE
NOKIA Bochum
SS-46
CA-89DS
TRANSCEIVER
PRODUCT SPECIFIC
FLASH ADAPTER

Figure 3 Basic flash concept with FPS-21

Type	Description
Product specific devices	
FS-121	Flash adapter
Other devices	
FPS-21	Flash prommer box
AC-35	Power supply
PK-1/PKD-1	SW security device
SS-46	Interface adapter
	PC with Phoenix service software
Cables	
CA-89DS	Service cable
	USB cable

CU-4 flash concept with FPS-10

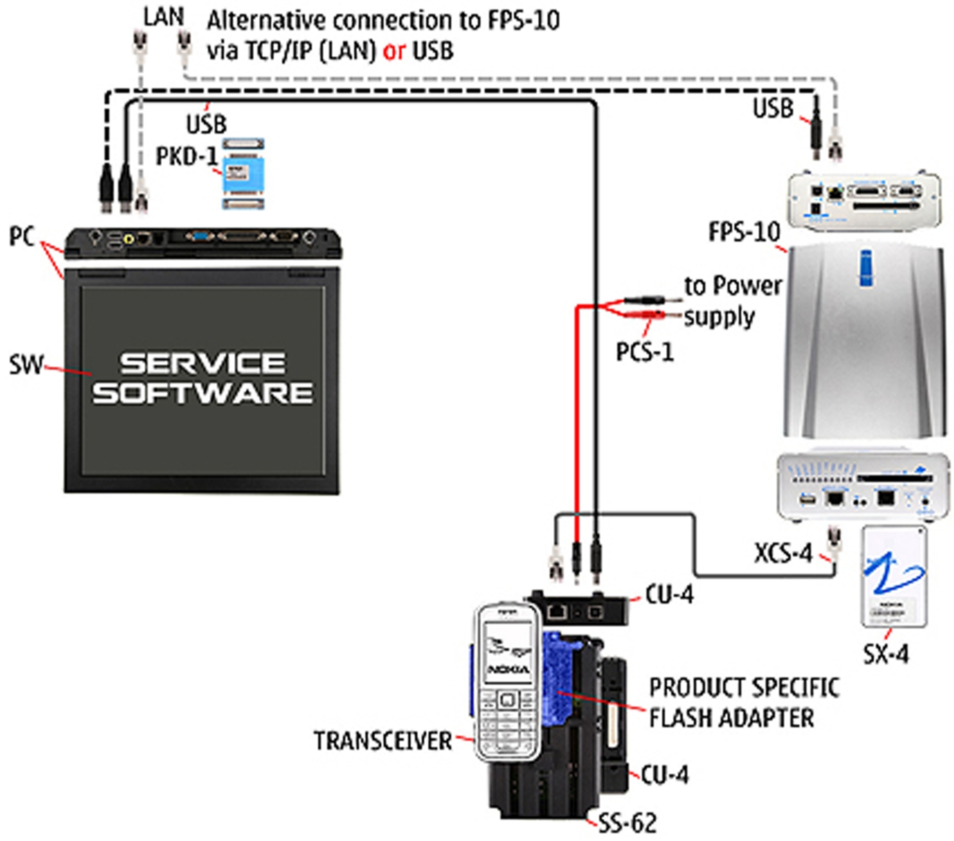

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
USB
USB
PKD-1
PC
SW
SERVICE SOFTWARE
FPS-10
to Power supply
PCS-1
XCS-4
CU-4
SX-4
PRODUCT SPECIFIC FLASH ADAPTER
TRANSCEIVER
CU-4
SS-62

Figure 4 CU-4 flash concept with FPS-10

Type	Description
Product specific devices	
FS-121	Flash adapter
Other devices	
CU-4	Control unit
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
SX-4	Smart card
	PC with Phoenix service software
Cables	
PCS-1	Power cable
XCS-4	Modular cable
	Standard USB cable
	USB cable

CU-4 flash concept with FPS-21

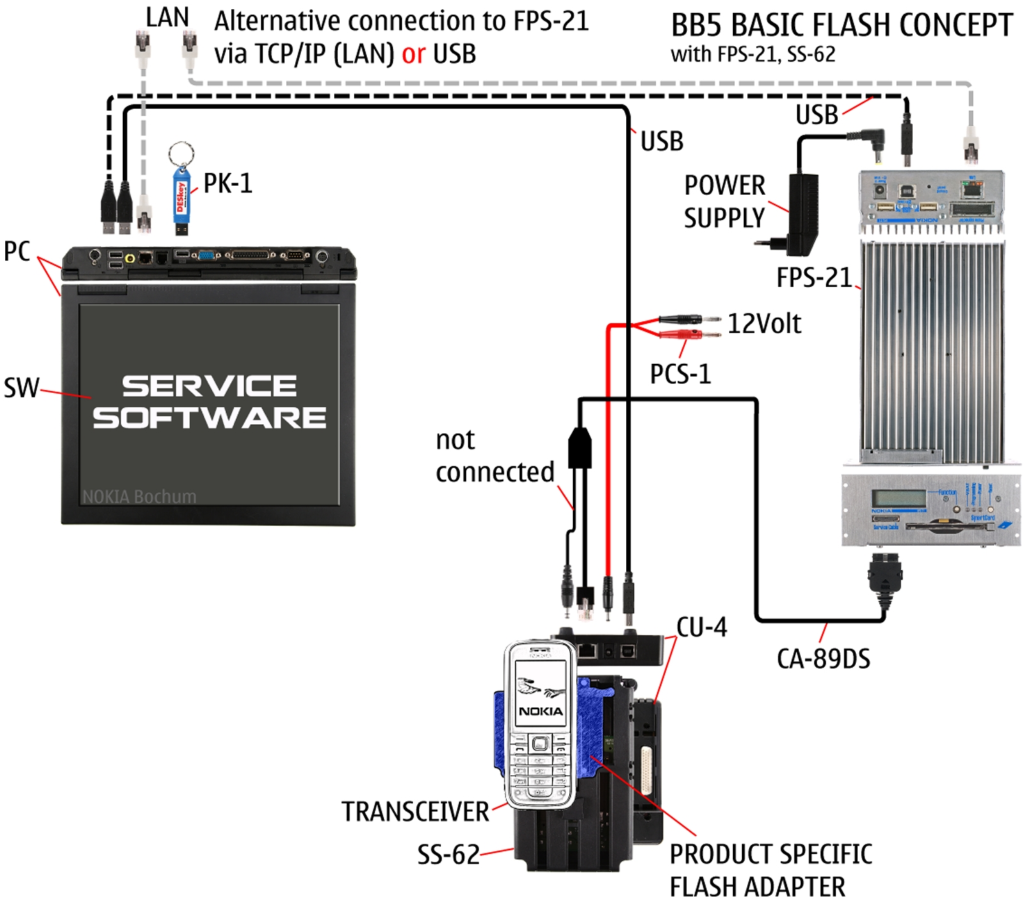

LAN
Alternative connection to FPS-21
via TCP/IP (LAN) or USB
BB5 BASIC FLASH CONCEPT
with FPS-21, SS-62
USB
USB
PK-1
POWER
SUPPLY
PC
FPS-21
12Volt
PCS-1
SW
SERVICE
SOFTWARE
NOKIA Bochum
not
connected
CU-4
CA-89DS
TRANSCEIVER
SS-62
PRODUCT SPECIFIC
FLASH ADAPTER

Figure 5 CU-4 flash concept with FPS-21

Type	Description
Product specific devices	
FS-121	Flash adapter
Other devices	
CU-4	Control unit
FPS-21	Flash prommer box
AC-35	Power supply
PK-1/PKD-1	SW security device
SS-62	Flash adapter base
SX-4	Smart card (for DCT-4 generation mobile device programming)
	PC with Phoenix service software
Cables	
PCS-1	Power cable
CA-89DS	Service cable
	Standard USB cable

Type	Description
	USB cable

Module jig service concept

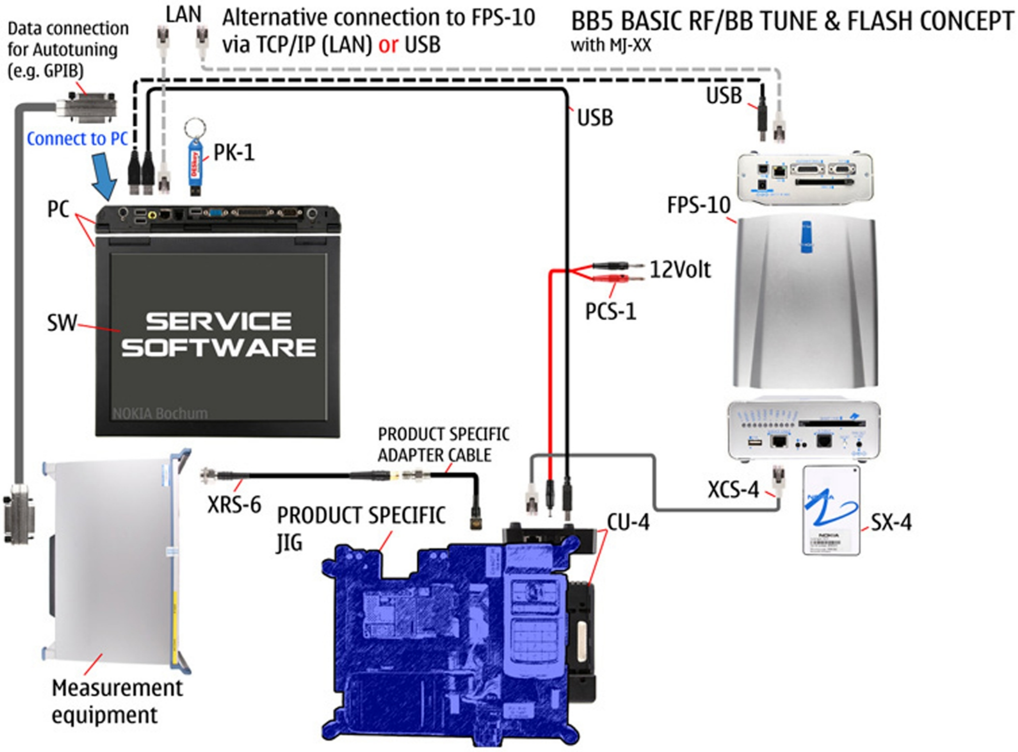

Data connection
for Autotuning
(e.g. GPIB)
LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
BB5 BASIC RF/BB TUNE & FLASH CONCEPT
with MJ-XX
USB
USB
Connect to PC
PK-1
PC
FPS-10
12Volt
PCS-1
SW
SERVICE
SOFTWARE
NOKIA Bochum
PRODUCT SPECIFIC
ADAPTER CABLE
XRS-6
PRODUCT SPECIFIC
JIG
XCS-4
CU-4
SX-4
Measurement
equipment

Figure 6 Module jig service concept

Type	Description
Phone specific tools	
MJ-240	Module jig
Other tools	
CU-4	Control unit
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SX-4	Smart card
	PC with Phoenix service software
	Measurement equipment
Cables	
CA-128RS	RF service cable (product-specific adapter cable)
PCS-1	DC power cable
XCS-4	Modular cable
XRS-6	RF cable

Type	Description
	USB cable
	GPIB control cable

RF testing concept with RF coupler

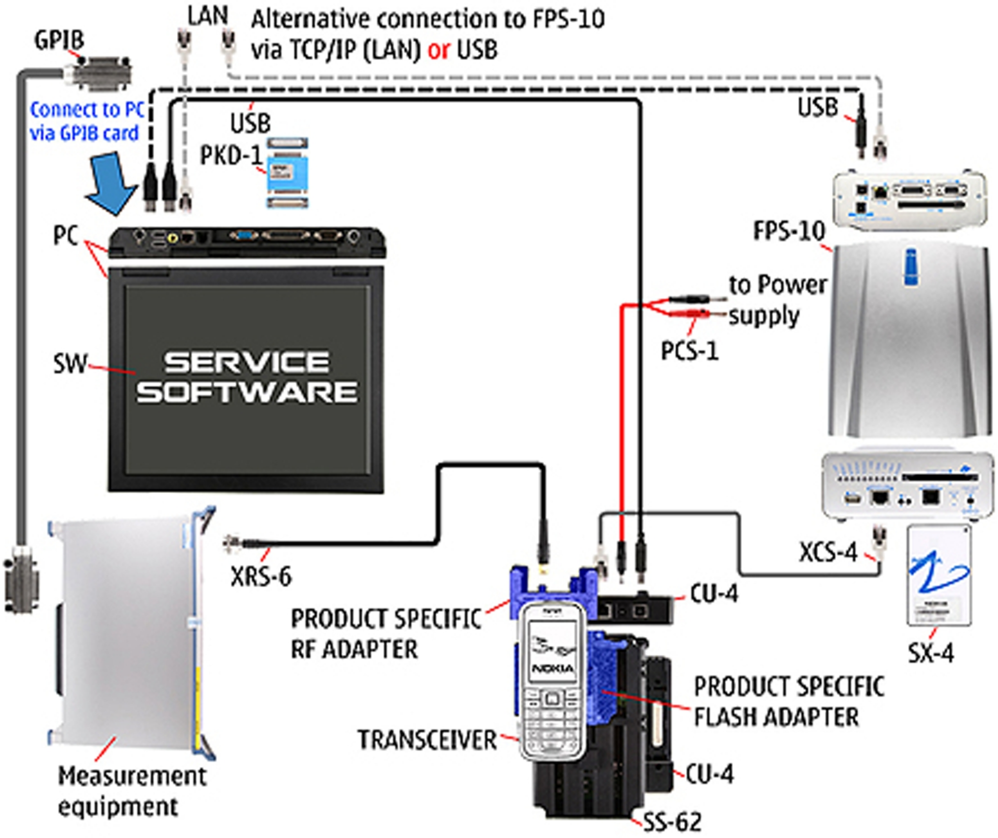

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
GPIB
Connect to PC
via GPIB card
USB
PKD-1
USB
FPS-10
PC
to Power
supply
PCS-1
SW
SERVICE
SOFTWARE
XRS-6
XCS-4
CU-4
SX-4
PRODUCT SPECIFIC
RF ADAPTER
PRODUCT SPECIFIC
FLASH ADAPTER
TRANSCEIVER
CU-4
Measurement
equipment
SS-62

Figure 7 RF testing concept with RF coupler

Type	Description
Product specific devices	
FS-121	Flash adapter
SA-138	RF coupler
Other devices	
CU-4	Control unit
SX-4	Smart card
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
	Measurement equipment
	PC with Phoenix service software
Cables	

Type	Description
PCS-1	Power cable
XCS-4	Modular cable
XRS-6	RF cable
	GPIB control cable
	USB cable

Service concept for RF testing and RF/BB tuning

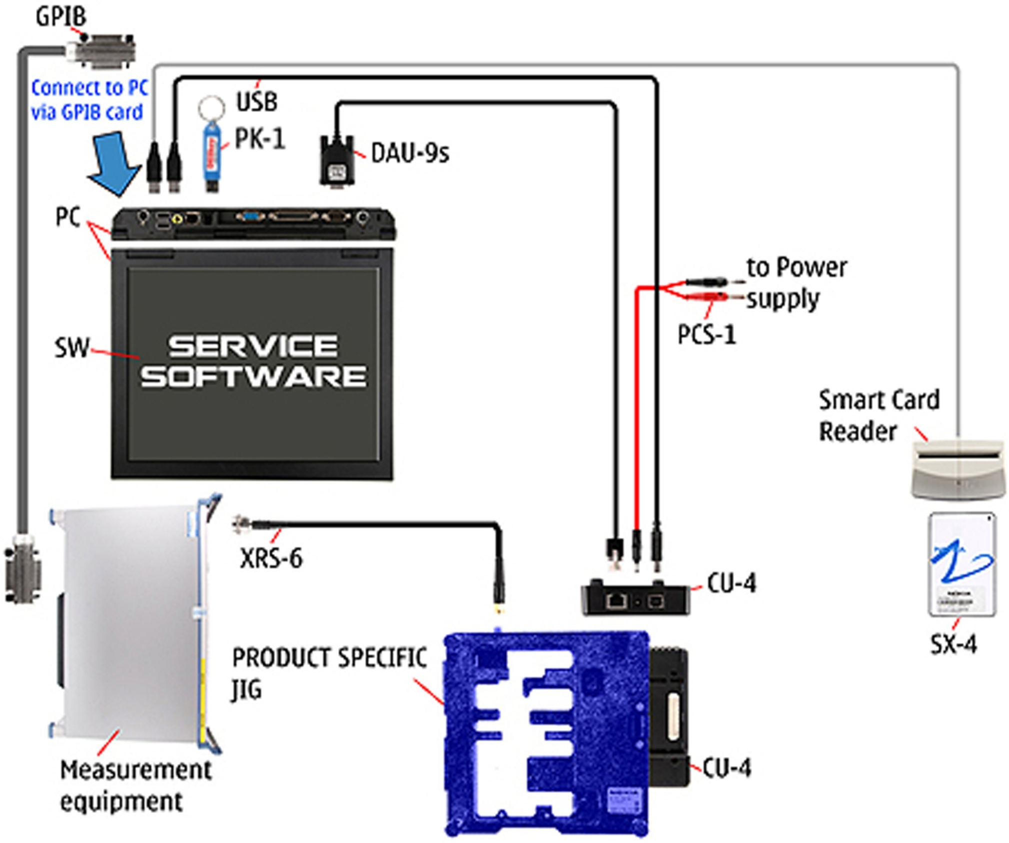

GPIB
Connect to PC via GPIB card
USB
PK-1
DAU-9s
PC
SW
SERVICE SOFTWARE
to Power supply
PCS-1
Smart Card Reader
XRS-6
CU-4
SX-4
PRODUCT SPECIFIC JIG
Measurement equipment
CU-4

Figure 8 Service concept for RF testing and RF/BB tuning

Type	Description
Product specific devices	
MJ-240	Module jig
Other devices	
CU-4	Control unit
PK-1/PKD-1	SW security device
SX-4	Smart card
	Measurement equipment
	Smart card reader

Type	Description
	PC with Phoenix service software
Cables	
DAU-9S	MBUS cable
PCS-1	DC power cable
XRS-6	RF cable
	GPIB control cable
	USB cable

Bluetooth testing concept with SB-6

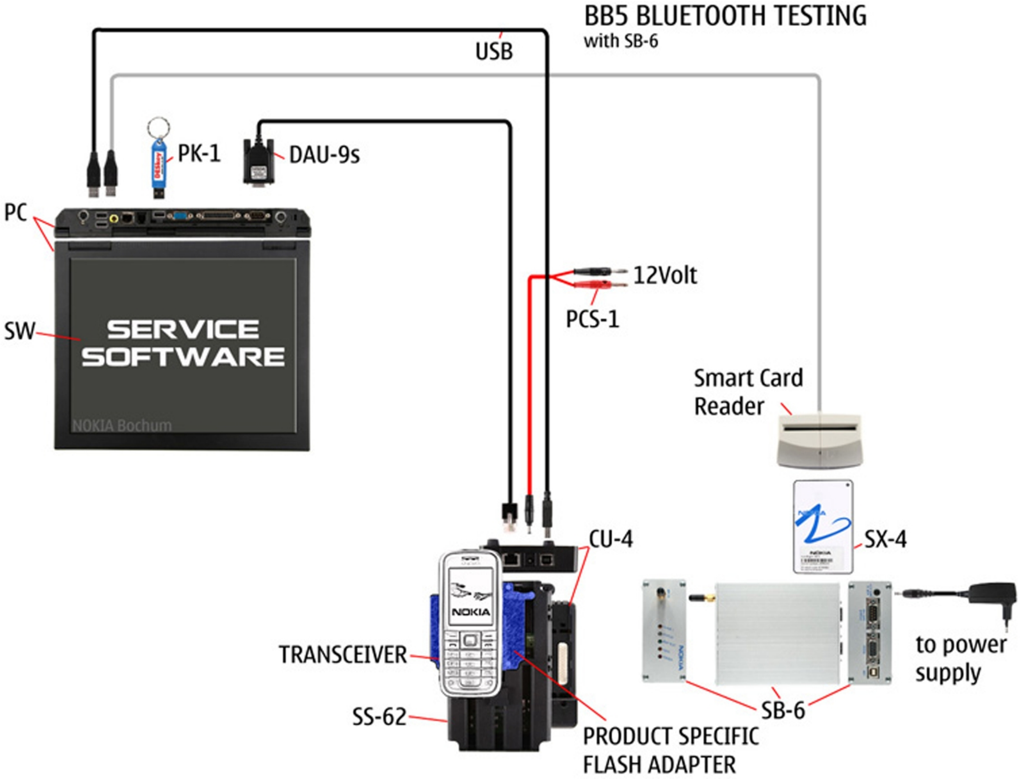

BB5 BLUETOOTH TESTING
with SB-6
USB
PK-1
DAU-9s
PC
SW
SERVICE SOFTWARE
NOKIA Bochum
12Volt
PCS-1
Smart Card Reader
CU-4
SX-4
TRANSCEIVER
SS-62
to power supply
SB-6
PRODUCT SPECIFIC FLASH ADAPTER

Figure 9 Service concept for RF testing and RF/BB tuning

Type	Description
Product specific devices	
FS-121	Flash adapter
Other devices	
CU-4	Control unit
SS-62	Flash adapter base
PK-1	SW security device
SX-4	Smart card
SB-6	Bluetooth test and interface box

Type	Description
	Smart card reader
	PC with Phoenix service software
Cables	
DAU-9S	MBUS cable
PCS-1	DC power cable
	USB cable

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3 — BB Troubleshooting and Manual Tuning Guide

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    FM radio troubleshooting 3–45
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Figure 21 Bluetooth self tests in Phoenix 3–44

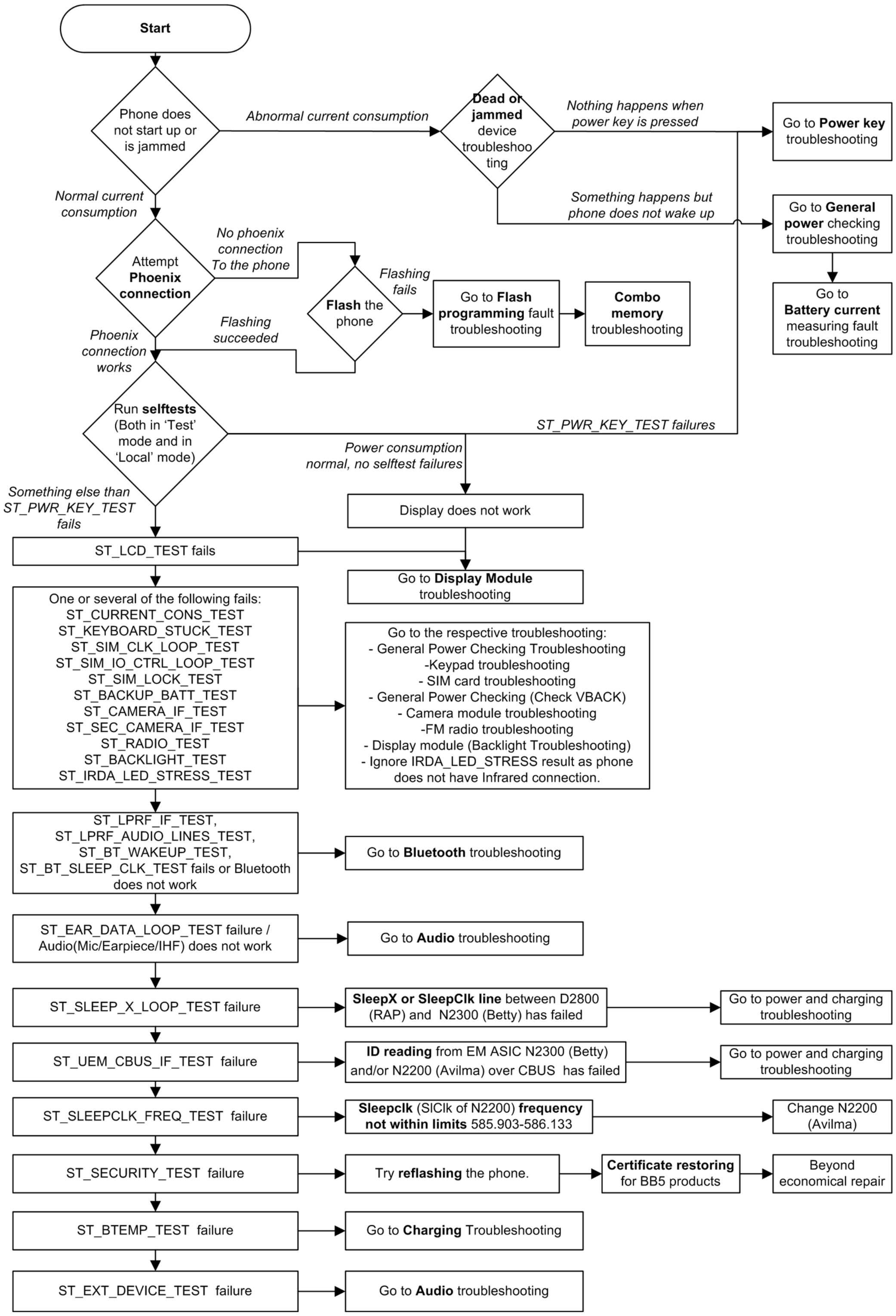
Baseband self tests in Phoenix

Context

Always start the troubleshooting procedure by running the Phoenix self tests. If a test fails, please follow the diagram below.

If the phone is dead and you cannot perform the self tests, go to *Dead or jammed device troubleshooting.*

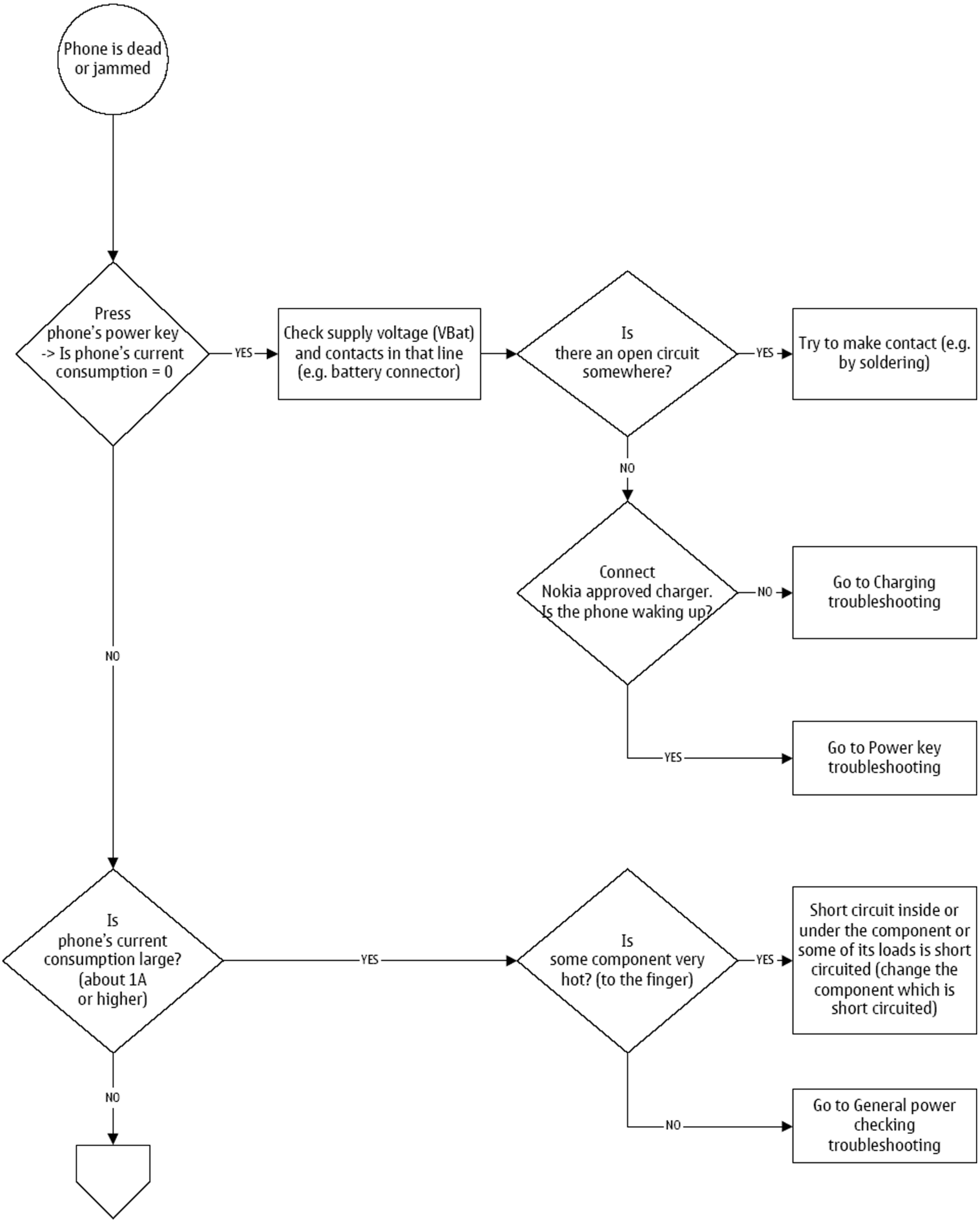
Troubleshooting flow


Start
Phone does not start up or is jammed
Abnormal current consumption
Dead or jammed device troubleshooting
Nothing happens when power key is pressed
Go to Power key troubleshooting
Something happens but phone does not wake up
Go to General power checking troubleshooting
Go to Battery current measuring fault troubleshooting
Normal current consumption
Attempt Phoenix connection
No phoenix connection To the phone
Flash the phone
Flashing fails
Go to Flash programming fault troubleshooting
Combo memory troubleshooting
Flashing succeeded
Phoenix connection works
Run selftests (Both in 'Test' mode and in 'Local' mode)
ST_PWR_KEY_TEST failures
Power consumption normal, no selftest failures
Display does not work
Something else than ST_PWR_KEY_TEST fails
ST_LCD_TEST fails
Go to Display Module troubleshooting
One or several of the following fails: ST_CURRENT_CONS_TEST ST_KEYBOARD_STUCK_TEST ST_SIM_CLK_LOOP_TEST ST_SIM_IO_CTRL_LOOP_TEST ST_SIM_LOCK_TEST ST_BACKUP_BATT_TEST ST_CAMERA_IF_TEST ST_SEC_CAMERA_IF_TEST ST_RADIO_TEST ST_BACKLIGHT_TEST ST_IRDA_LED_STRESS_TEST
Go to the respective troubleshooting: - General Power Checking Troubleshooting -Keypad troubleshooting - SIM card troubleshooting - General Power Checking (Check VBACK) - Camera module troubleshooting -FM radio troubleshooting - Display module (Backlight Troubleshooting) - Ignore IRDA_LED_STRESS result as phone does not have Infrared connection.
ST_LPRF_IF_TEST, ST_LPRF_AUDIO_LINES_TEST, ST_BT_WAKEUP_TEST, ST_BT_SLEEP_CLK_TEST fails or Bluetooth does not work
Go to Bluetooth troubleshooting
ST_EAR_DATA_LOOP_TEST failure / Audio(Mic/Earpiece/IHF) does not work
Go to Audio troubleshooting
ST_SLEEP_X_LOOP_TEST failure
SleepX or SleepClk line between D2800 (RAP) and N2300 (Betty) has failed
Go to power and charging troubleshooting
ST_UEM_CBUS_IF_TEST failure
ID reading from EM ASIC N2300 (Betty) and/or N2200 (Avilma) over CBUS has failed
Go to power and charging troubleshooting
ST_SLEEPCLK_FREQ_TEST failure
Sleepclk (SlClk of N2200) frequency not within limits 585.903-586.133
Change N2200 (Avilma)
ST_SECURITY_TEST failure
Try reflashing the phone.
Certificate restoring for BB5 products
Beyond economical repair
ST_BTEMP_TEST failure
Go to Charging Troubleshooting
ST_EXT_DEVICE_TEST failure
Go to Audio troubleshooting

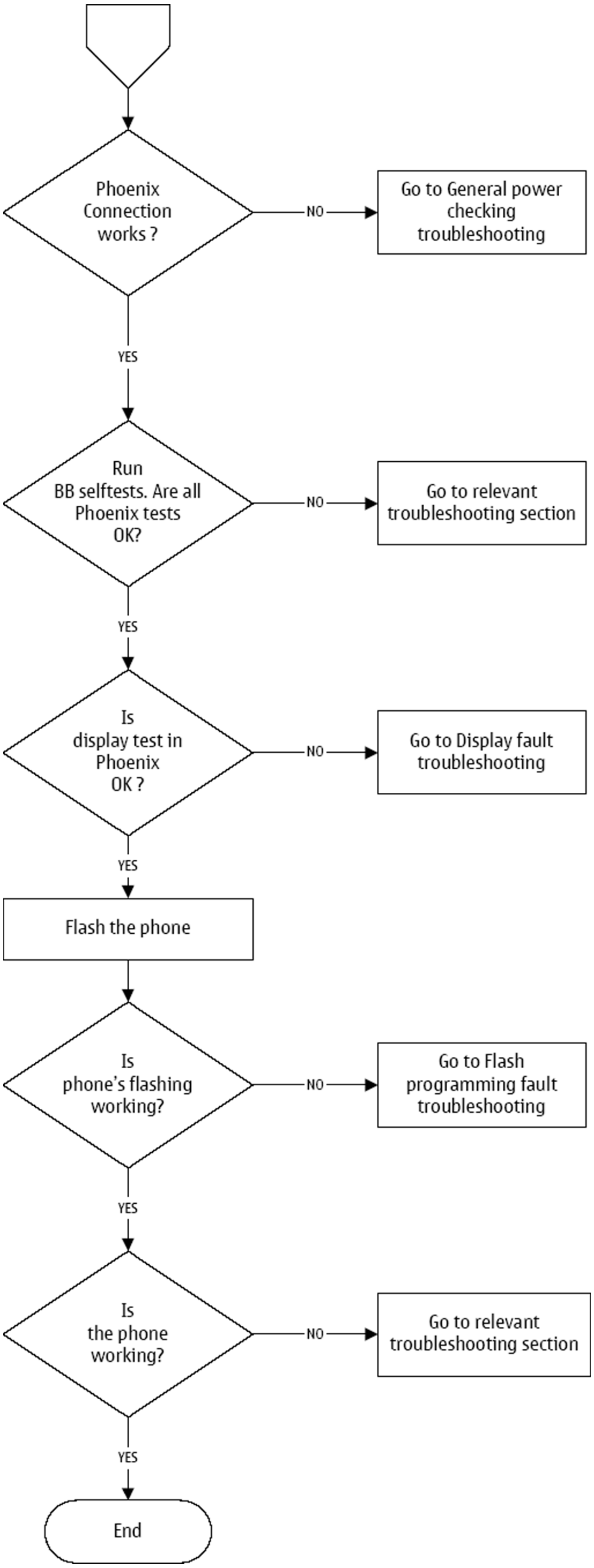
Power and charging troubleshooting

Dead or jammed device troubleshooting

Troubleshooting flow


Phone is dead or jammed
Press phone's power key -> Is phone's current consumption = 0
YES
Check supply voltage (VBat) and contacts in that line (e.g. battery connector)
Is there an open circuit somewhere?
YES
Try to make contact (e.g. by soldering)
NO
Connect Nokia approved charger. Is the phone waking up?
NO
Go to Charging troubleshooting
YES
Go to Power key troubleshooting
NO
Is phone's current consumption large? (about 1A or higher)
YES
Is some component very hot? (to the finger)
YES
Short circuit inside or under the component or some of its loads is short circuited (change the component which is short circuited)
NO
Go to General power checking troubleshooting
NO

Troubleshooting flow


Phoenix Connection works ?
NO
Go to General power checking troubleshooting
YES
Run BB selftests. Are all Phoenix tests OK?
NO
Go to relevant troubleshooting section
YES
Is display test in Phoenix OK ?
NO
Go to Display fault troubleshooting
YES
Flash the phone
Is phone's flashing working?
NO
Go to Flash programming fault troubleshooting
YES
Is the phone working?
NO
Go to relevant troubleshooting section
YES
End

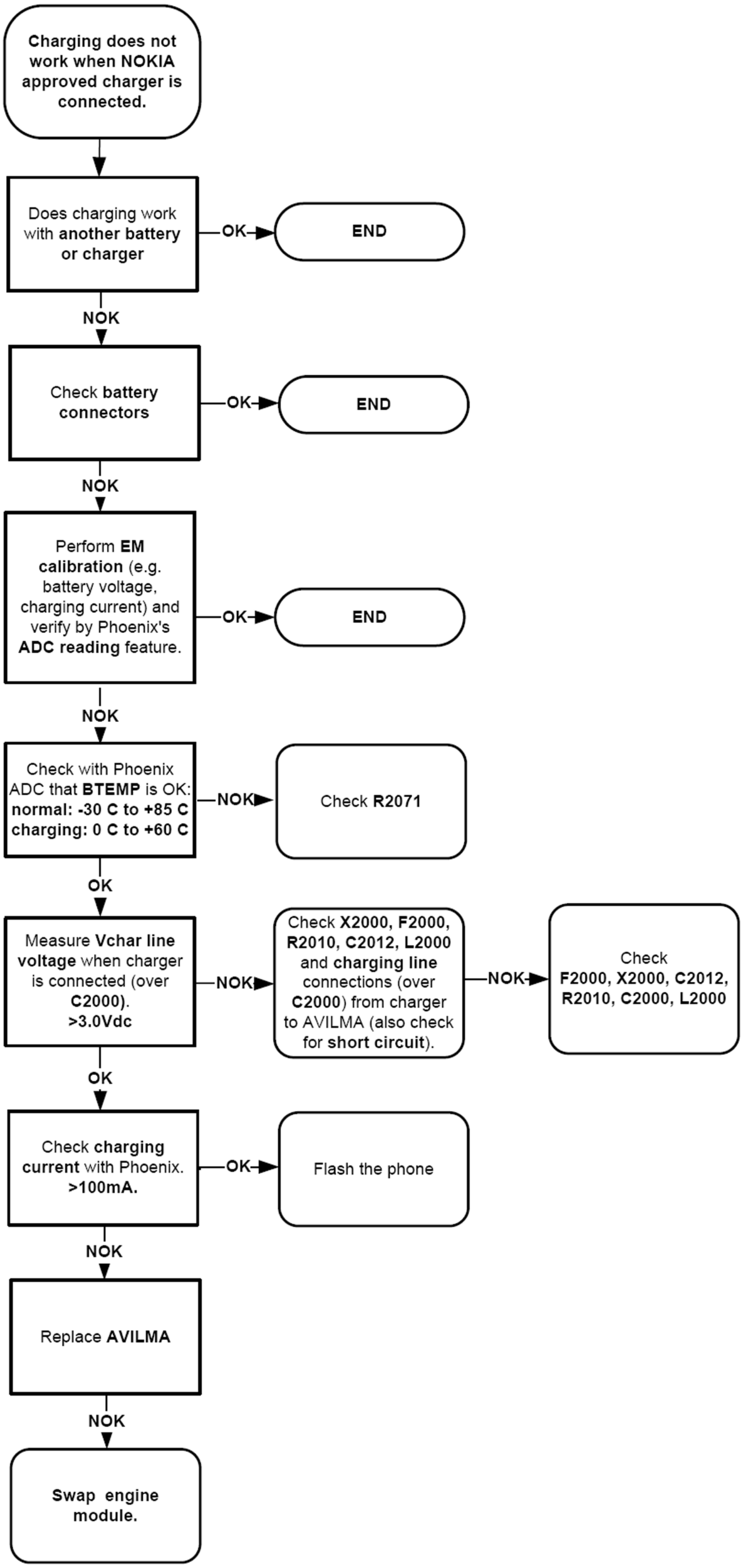
General power checking

Check the following voltages:

Signal name	Regulator	Sleep	Idle	Nominal voltage	Main user	Notes
VIO	AVILMA	ON	ON	1.82	Memory, I/Os, Display	
VBACK	AVILMA	ON	ON	2.5	Back-up battery	
VSIM1	AVILMA	ON	ON	1.8/3.0	SIM card	
VDRAM	AVILMA	ON	ON	1.82	SDRAM	
VAUX	AVILMA	ON	ON	2.78	Camera, Display	
VR1	AVILMA	OFF	ON	2.5	Crystal oscillators, RFIC	
VRFC	AVILMA	OFF	ON	1.8	RAPS	
VRCP1	AVILMA			4.75	To RF parts	RF active
VREF	AVILMA	ON	ON	1.35	RF reference	
VCORE	BETTY	ON	ON	1.05 1.25 1.35 1.40	RAPS digital	
VOUT	BETTY	OFF	OFF	2.5		Accessory connected
VMMC	KMBGN000A/ N3200	OFF	OFF	2.850	Internal memory	Disabled in sleep
VLED_POS	TPS61061/ N2301	OFF	OFF	14.5	LCD Backlight	Disabled in sleep

Charging troubleshooting

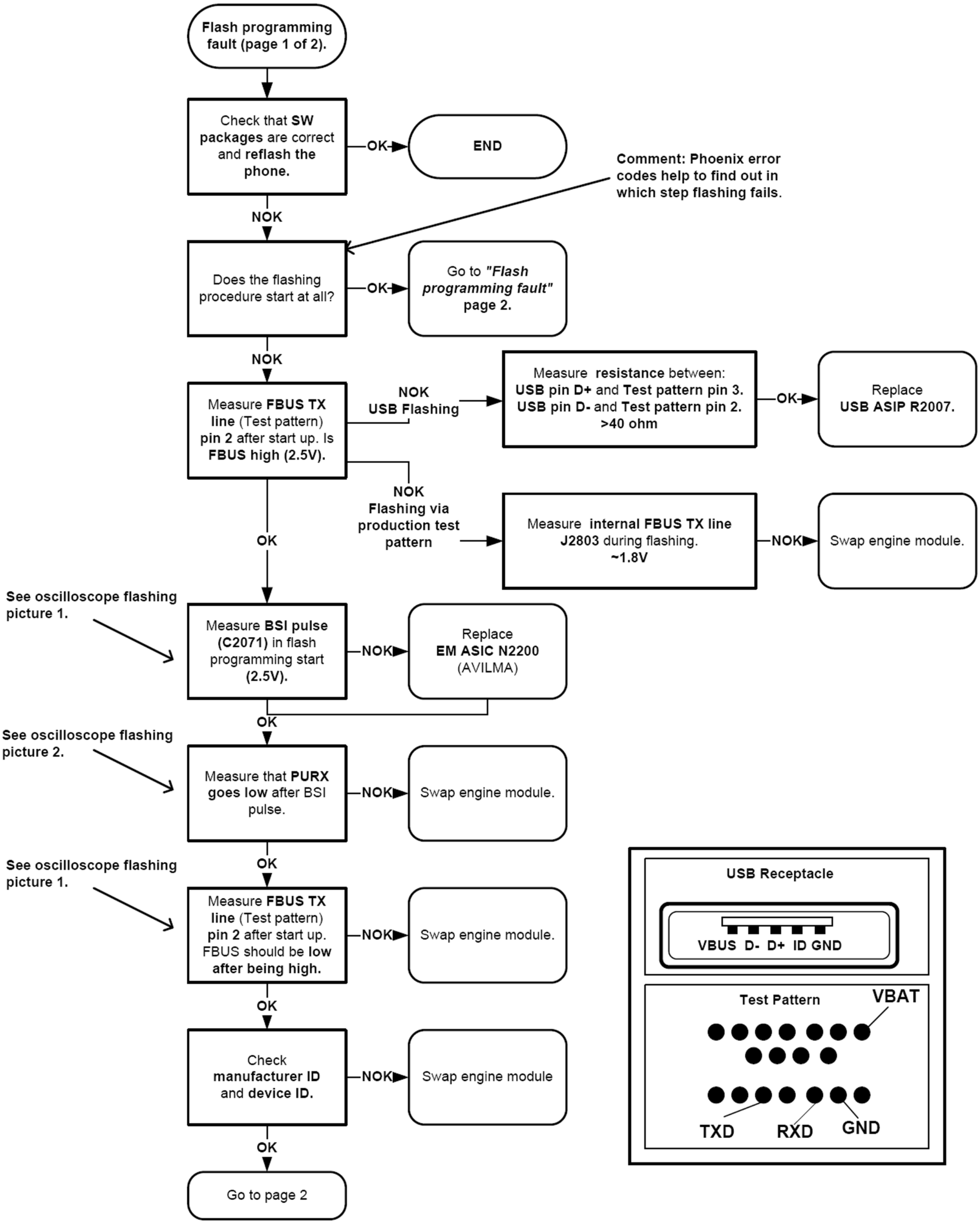
Troubleshooting flow


Charging does not work when NOKIA approved charger is connected.
Does charging work with another battery or charger
OK
END
NOK
Check battery connectors
OK
END
NOK
Perform EM calibration (e.g. battery voltage, charging current) and verify by Phoenix's ADC reading feature.
OK
END
NOK
Check with Phoenix ADC that BTEMP is OK: normal: -30 C to +85 C charging: 0 C to +60 C
NOK
Check R2071
OK
Measure Vchar line voltage when charger is connected (over C2000). >3.0Vdc
NOK
Check X2000, F2000, R2010, C2012, L2000 and charging line connections (over C2000) from charger to AVILMA (also check for short circuit).
NOK
Check F2000, X2000, C2012, R2010, C2000, L2000
OK
Check charging current with Phoenix. >100mA.
OK
Flash the phone
NOK
Replace AVILMA
NOK
Swap engine module.

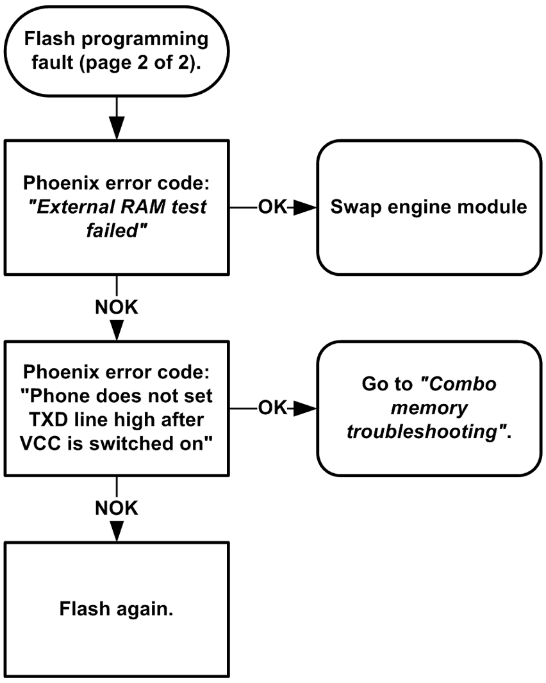
Interface troubleshooting

Flash programming fault troubleshooting

Part 1


Flash programming fault (page 1 of 2).
Check that SW packages are correct and reflash the phone.
OK
END
Comment: Phoenix error codes help to find out in which step flashing fails.
NOK
Does the flashing procedure start at all?
OK
Go to "Flash programming fault" page 2.
NOK
Measure FBUS TX line (Test pattern) pin 2 after start up. Is FBUS high (2.5V).
NOK
USB Flashing
Measure resistance between: USB pin D+ and Test pattern pin 3. USB pin D- and Test pattern pin 2. >40 ohm
OK
Replace USB ASIP R2007.
NOK
Flashing via production test pattern
Measure internal FBUS TX line J2803 during flashing. ~1.8V
NOK
Swap engine module.
OK
See oscilloscope flashing picture 1.
Measure BSI pulse (C2071) in flash programming start (2.5V).
NOK
Replace EM ASIC N2200 (AVILMA)
OK
See oscilloscope flashing picture 2.
Measure that PURX goes low after BSI pulse.
NOK
Swap engine module.
OK
See oscilloscope flashing picture 1.
Measure FBUS TX line (Test pattern) pin 2 after start up. FBUS should be low after being high.
NOK
Swap engine module.
OK
Check manufacturer ID and device ID.
NOK
Swap engine module
OK
Go to page 2
USB Receptacle
VBUS D- D+ ID GND
Test Pattern
VBAT
TXD
RXD
GND

Part 2


Flash programming fault (page 2 of 2).
Phoenix error code: "External RAM test failed"
OK
Swap engine module
NOK
Phoenix error code: "Phone does not set TXD line high after VCC is switched on"
OK
Go to "Combo memory troubleshooting".
NOK
Flash again.

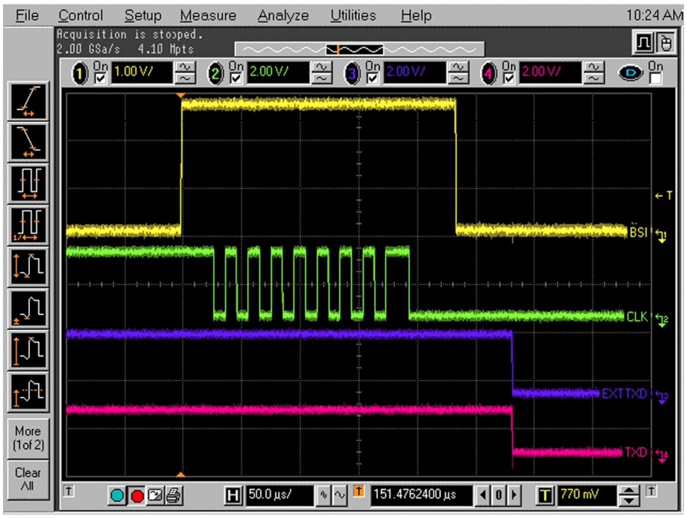
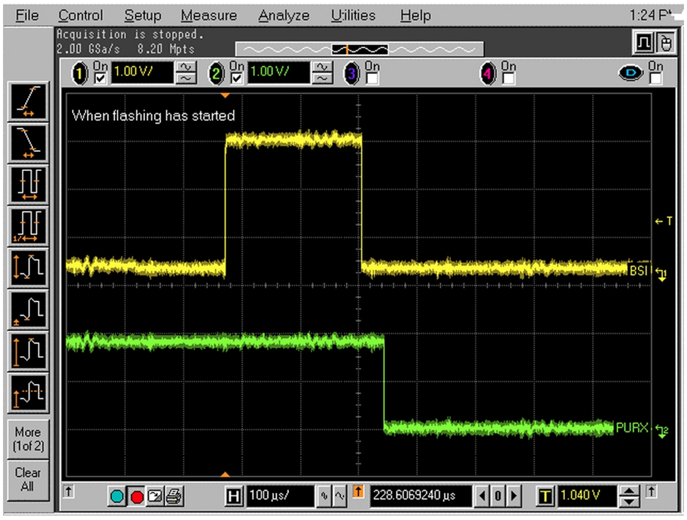

File
Control
Setup
Measure
Analyze
Utilities
Help
10:24 AM
Acquisition is stopped.
2.00 GSa/s 4.10 Mpts
1.00 V/
2.00 V/
2.00 V/
2.00 V/
BSI
CLK
EXTTXD
TXD
More (1of 2)
Clear All
50.0 µs/
151.4762400 µs
770 mV

Figure 10 Flashing pic 1. Take single trig measurement for the rise of the BSI signal.



Acquisition is stopped.
2.00 GSa/s 8.20 Mpts

1 On ☑ 1.00 V/
2 On ☑ 1.00 V/
3 On ☐
4 On ☐
On ☐

When flashing has started

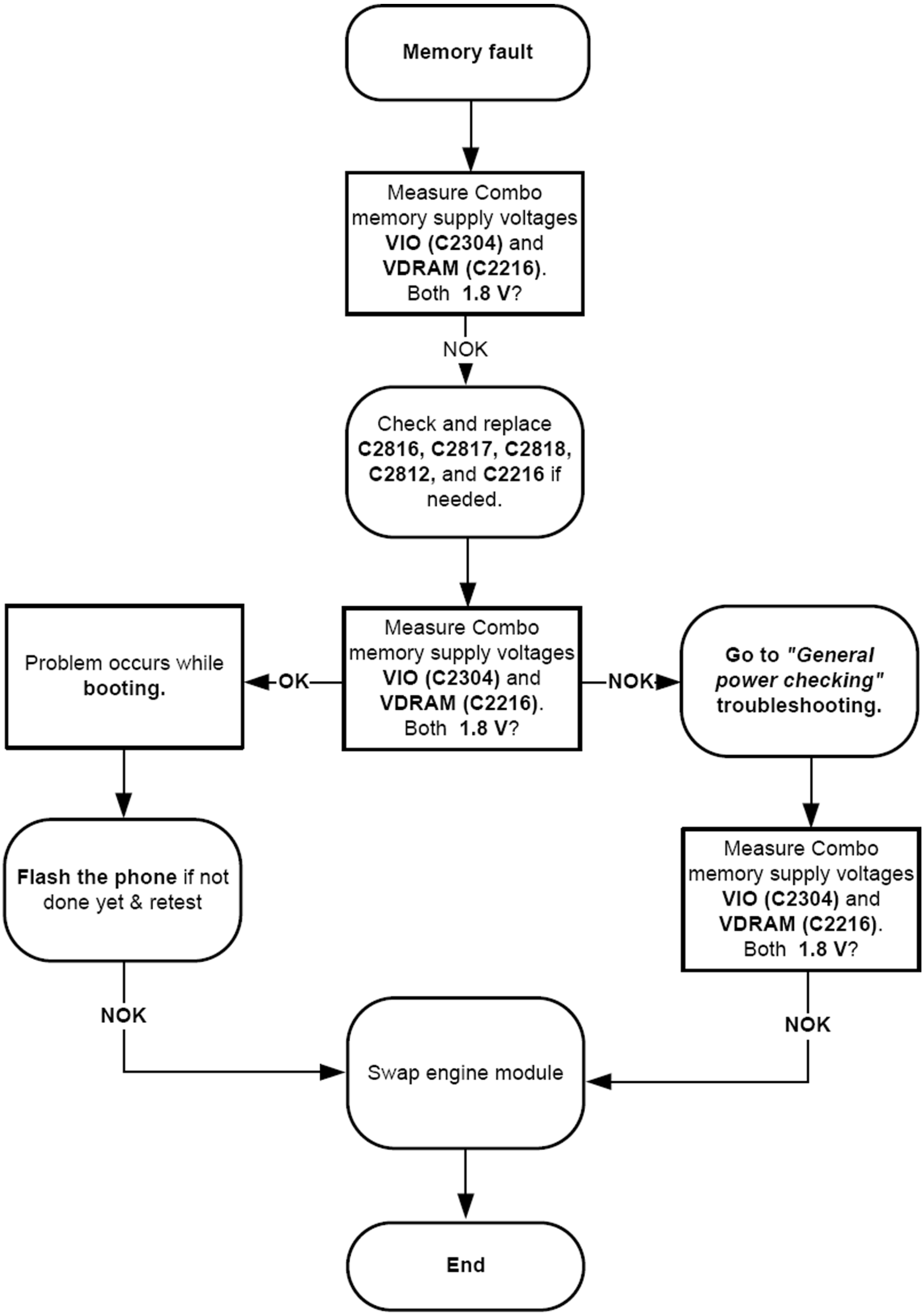
H 100 µs/
228.6069240 µs
T 1.040 V

File
Control
Setup
Measure
Analyze
Utilities
Help
1:24 P
← T
BSI
PURX
More (1of 2)
Clear All

Figure 11 Flashing pic 2. Take single trig measurement for the rise of the BSI signal.

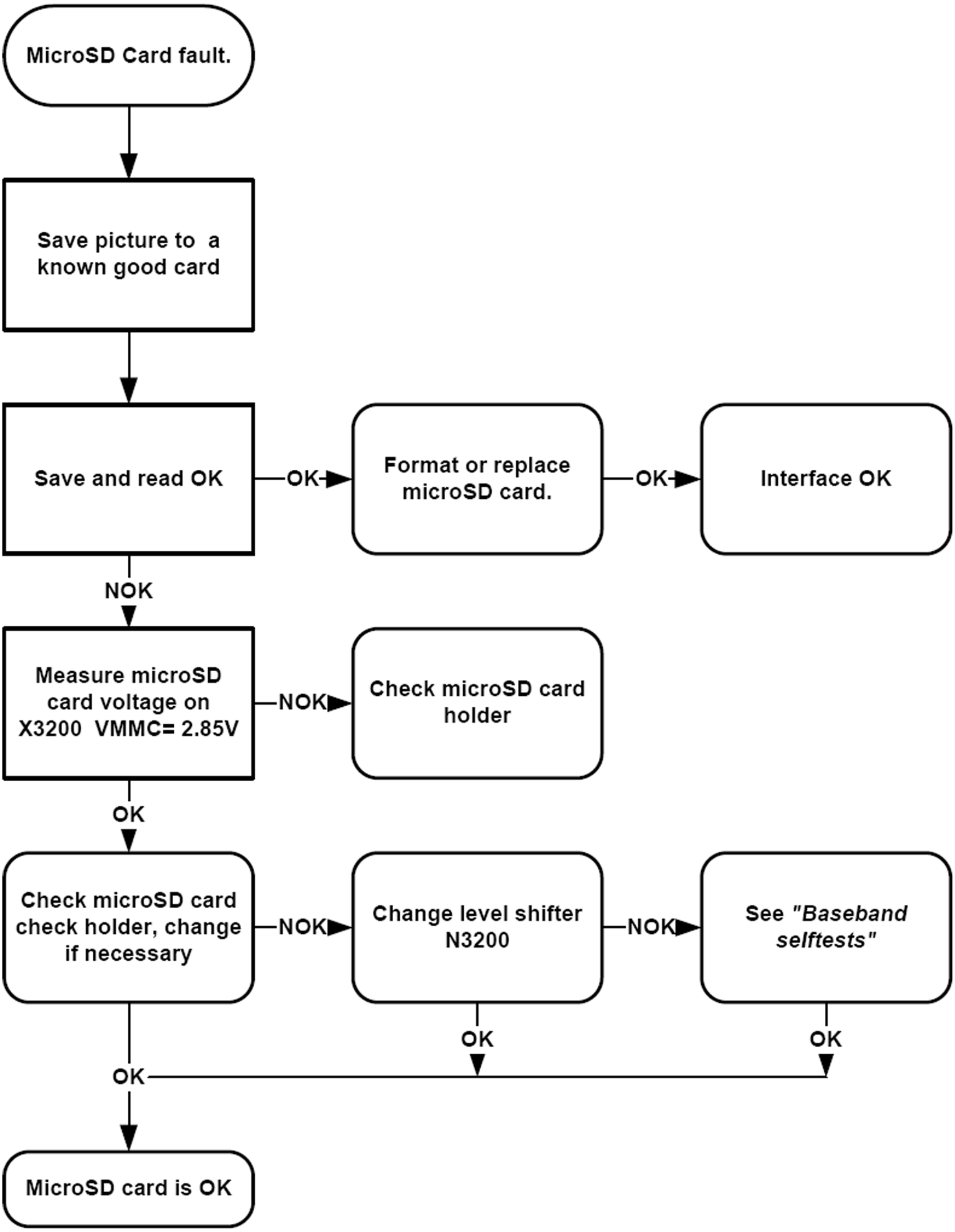
Combo memory troubleshooting

Troubleshooting flow


Memory fault
Measure Combo memory supply voltages VIO (C2304) and VDRAM (C2216). Both 1.8 V?
NOK
Check and replace C2816, C2817, C2818, C2812, and C2216 if needed.
Measure Combo memory supply voltages VIO (C2304) and VDRAM (C2216). Both 1.8 V?
OK
Problem occurs while booting.
NOK
Go to "General power checking" troubleshooting.
Flash the phone if not done yet & retest
Measure Combo memory supply voltages VIO (C2304) and VDRAM (C2216). Both 1.8 V?
NOK
NOK
Swap engine module
End

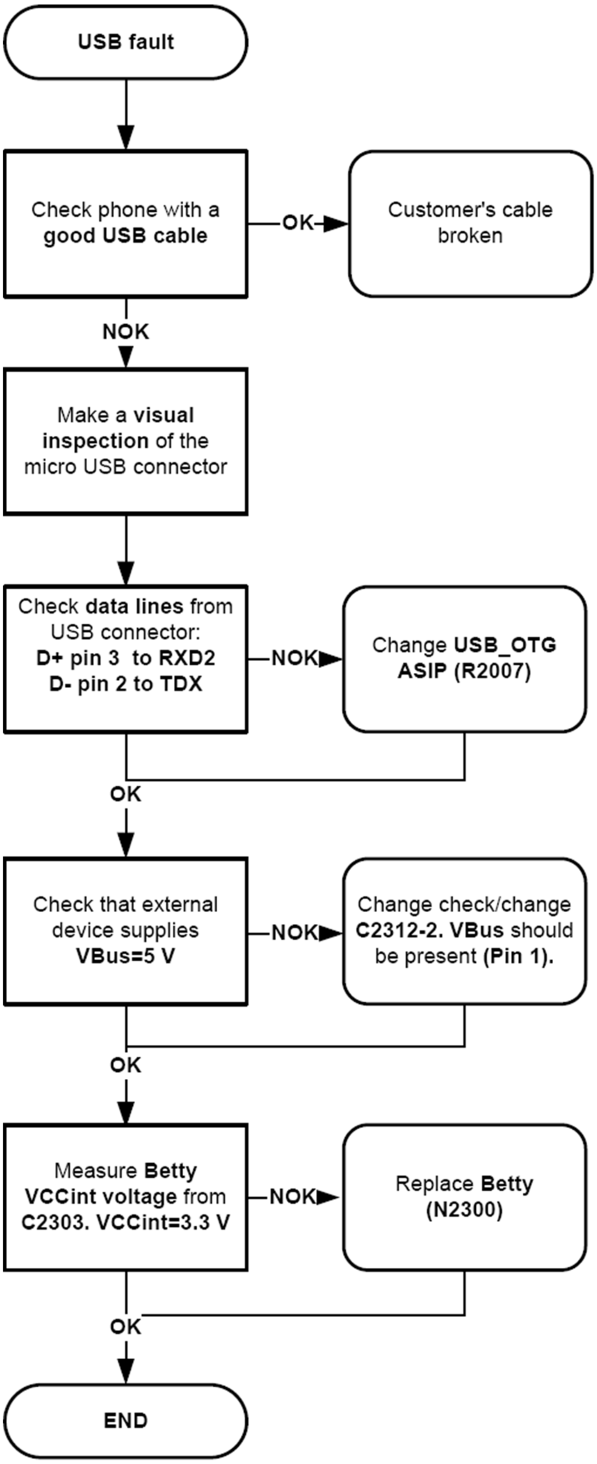
MicroSD card troubleshooting

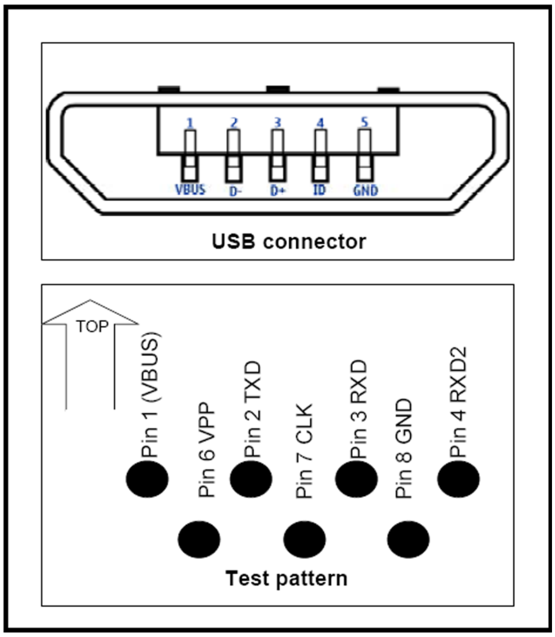
Troubleshooting flow


MicroSD Card fault.
Save picture to a known good card
Save and read OK
OK
Format or replace microSD card.
OK
Interface OK
NOK
Measure microSD card voltage on X3200 VMMC= 2.85V
NOK
Check microSD card holder
OK
Check microSD card check holder, change if necessary
NOK
Change level shifter N3200
NOK
See "Baseband selftests"
OK
OK
OK
MicroSD card is OK

USB interface troubleshooting

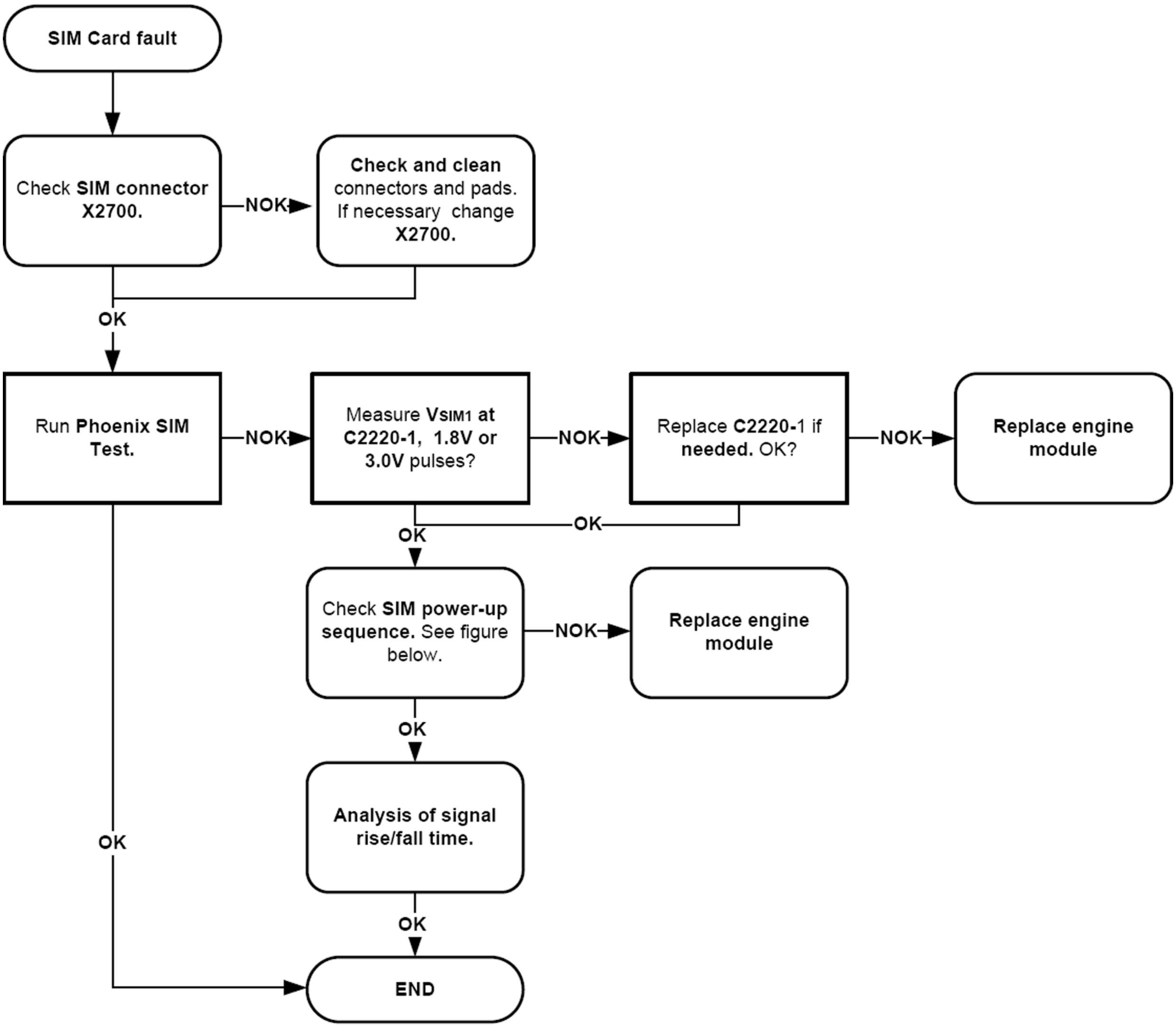
Troubleshooting flow

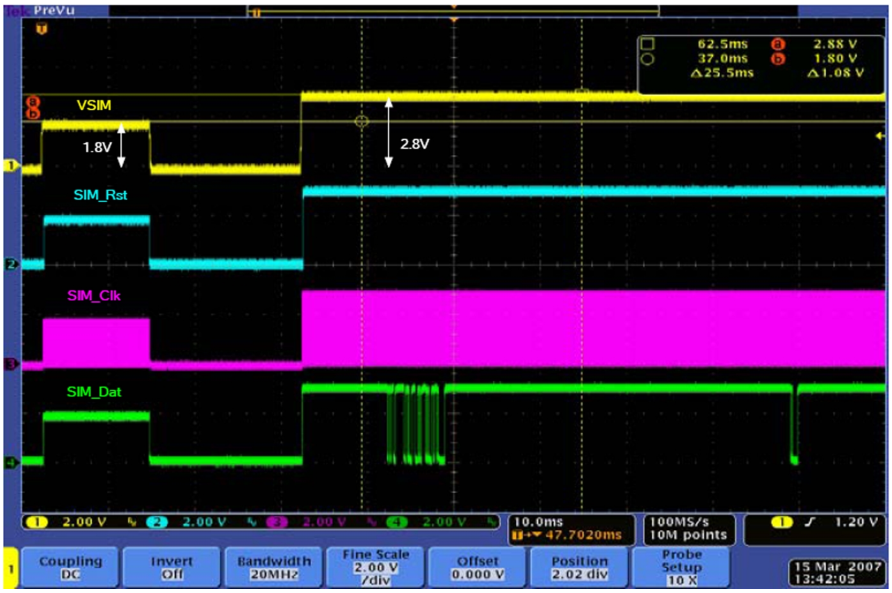

USB fault
Check phone with a good USB cable
OK
Customer's cable broken
NOK
Make a visual inspection of the micro USB connector
Check data lines from USB connector: D+ pin 3 to RXD2 D- pin 2 to TDX
NOK
Change USB_OTG ASIP (R2007)
OK
Check that external device supplies VBus=5 V
NOK
Change check/change C2312-2. VBus should be present (Pin 1).
OK
Measure Betty VCCint voltage from C2303. VCCint=3.3 V
NOK
Replace Betty (N2300)
OK
END


1
2
3
4
5
VBUS
D-
D+
ID
GND
USB connector
TOP
Pin 1 (VBUS)
Pin 6 VPP
Pin 2 TXD
Pin 7 CLK
Pin 3 RXD
Pin 8 GND
Pin 4 RXD2
Test pattern

SIM card troubleshooting

Troubleshooting flow


SIM Card fault
Check SIM connector X2700.
NOK
Check and clean connectors and pads. If necessary change X2700.
OK
Run Phoenix SIM Test.
NOK
Measure VSIM1 at C2220-1, 1.8V or 3.0V pulses?
NOK
Replace C2220-1 if needed. OK?
NOK
Replace engine module
OK
OK
Check SIM power-up sequence. See figure below.
NOK
Replace engine module
OK
Analysis of signal rise/fall time.
OK
OK
END



User interface troubleshooting

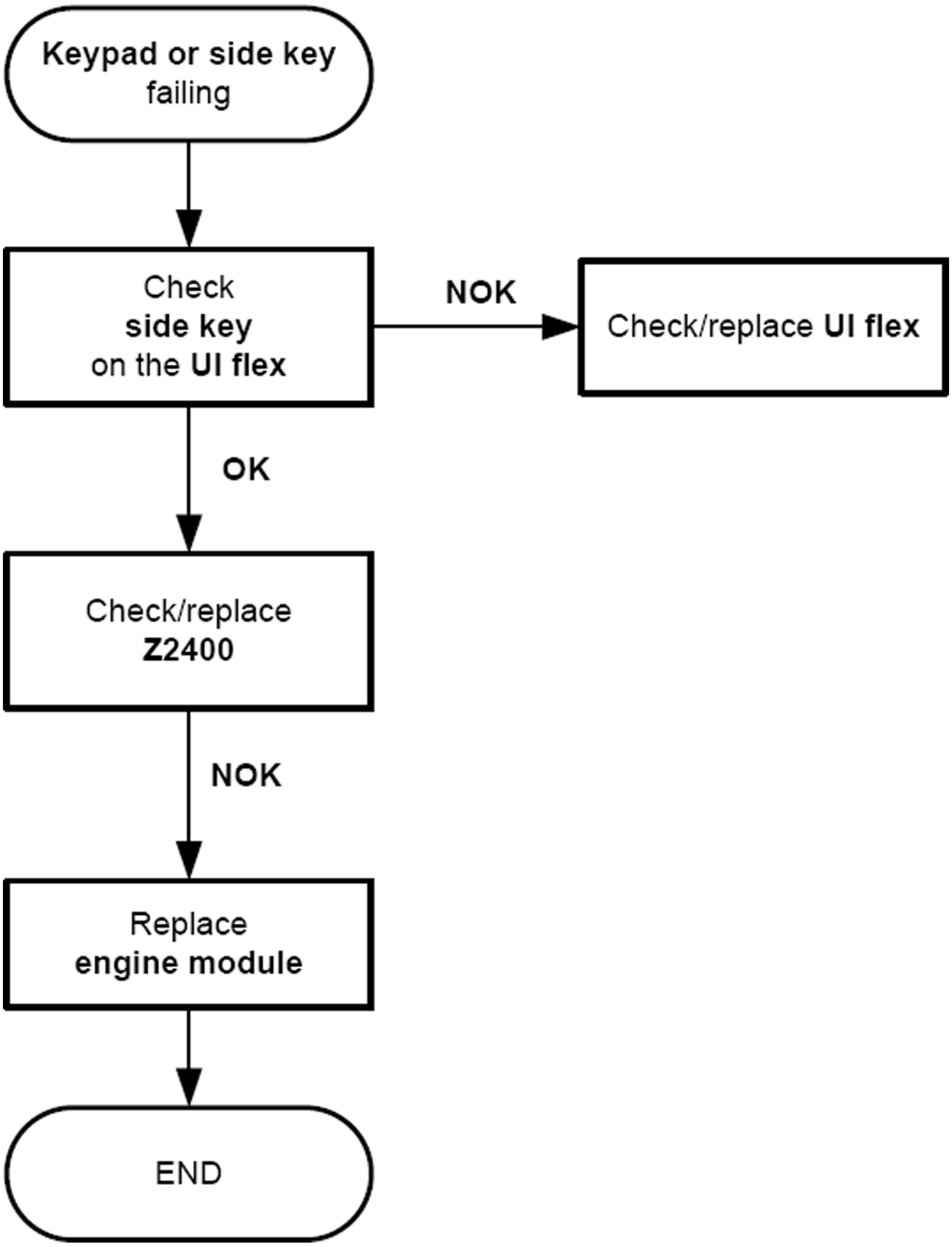
Keypad and side key troubleshooting

Context

If one or more keys are stuck, so that the key does not react when a keydome or the side key is pressed, the failure is caused by mechanical reasons (dirt, rust, mechanical damage, etc.)

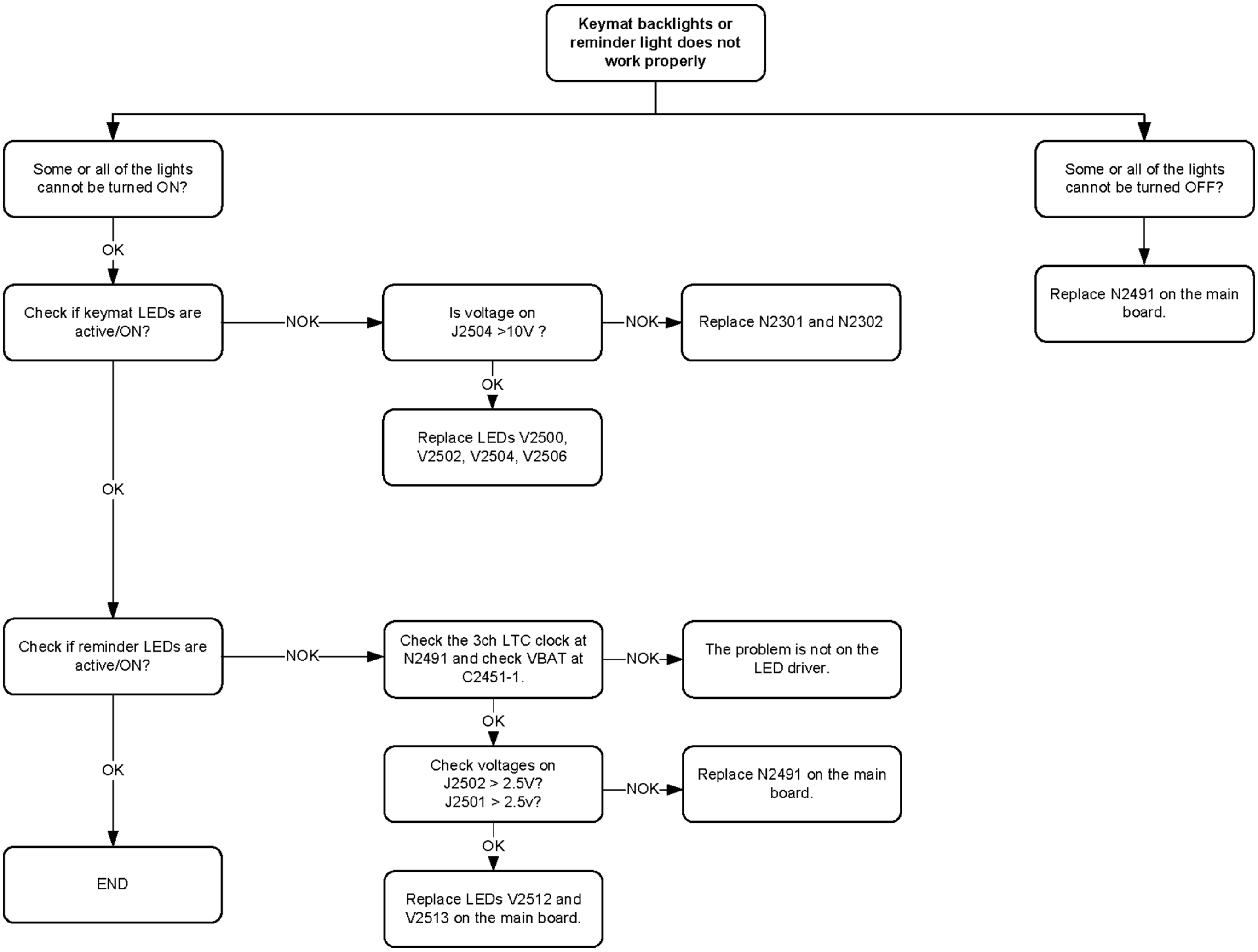
If the failure mode is not clear, start with the Keyboard test in Phoenix.

Troubleshooting flow


Keypad or side key failing
Check side key on the UI flex
NOK
Check/replace UI flex
OK
Check/replace Z2400
NOK
Replace engine module
END

Keymat backlight and reminder light troubleshooting

Troubleshooting flow


Keymat backlights or reminder light does not work properly
Some or all of the lights cannot be turned ON?
Some or all of the lights cannot be turned OFF?
Replace N2491 on the main board.
OK
Check if keymat LEDs are active/ON?
NOK
Is voltage on J2504 >10V ?
NOK
Replace N2301 and N2302
OK
Replace LEDs V2500, V2502, V2504, V2506
OK
Check if reminder LEDs are active/ON?
NOK
Check the 3ch LTC clock at N2491 and check VBAT at C2451-1.
NOK
The problem is not on the LED driver.
OK
Check voltages on J2502 > 2.5V? J2501 > 2.5v?
NOK
Replace N2491 on the main board.
OK
Replace LEDs V2512 and V2513 on the main board.
OK
END

Display module troubleshooting

General instructions for display troubleshooting

Context

- The display is in a normal mode when the phone is in active use.
- Display is in a sleep mode when the phone is in the screen saver mode.

Table 8 Display module troubleshooting cases

Display blank	There is no image on the display. The display looks the same when the phone is on as it does when the phone is off. The backlight can be on in some cases.

Image on the display not correct	Image on the display can be corrupted or a part of the image can be missing. If a part of the image is missing, change the display module. If the image is otherwise corrupted, follow the appropriate troubleshooting diagram.
Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. This means that in case the display is working (image OK), the backlight is faulty.
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the following table.

Table 9 Pixel defects

Item		White dot defect				Black dot defect	Total
1	Defect counts	R	G	B	White Dot Total	1	1
		1	1	1	1		
2	Combined defect counts	Not allowed. Two single dot defects that are within 5 mm of each other should be interpreted as combined dot defect.					

Steps

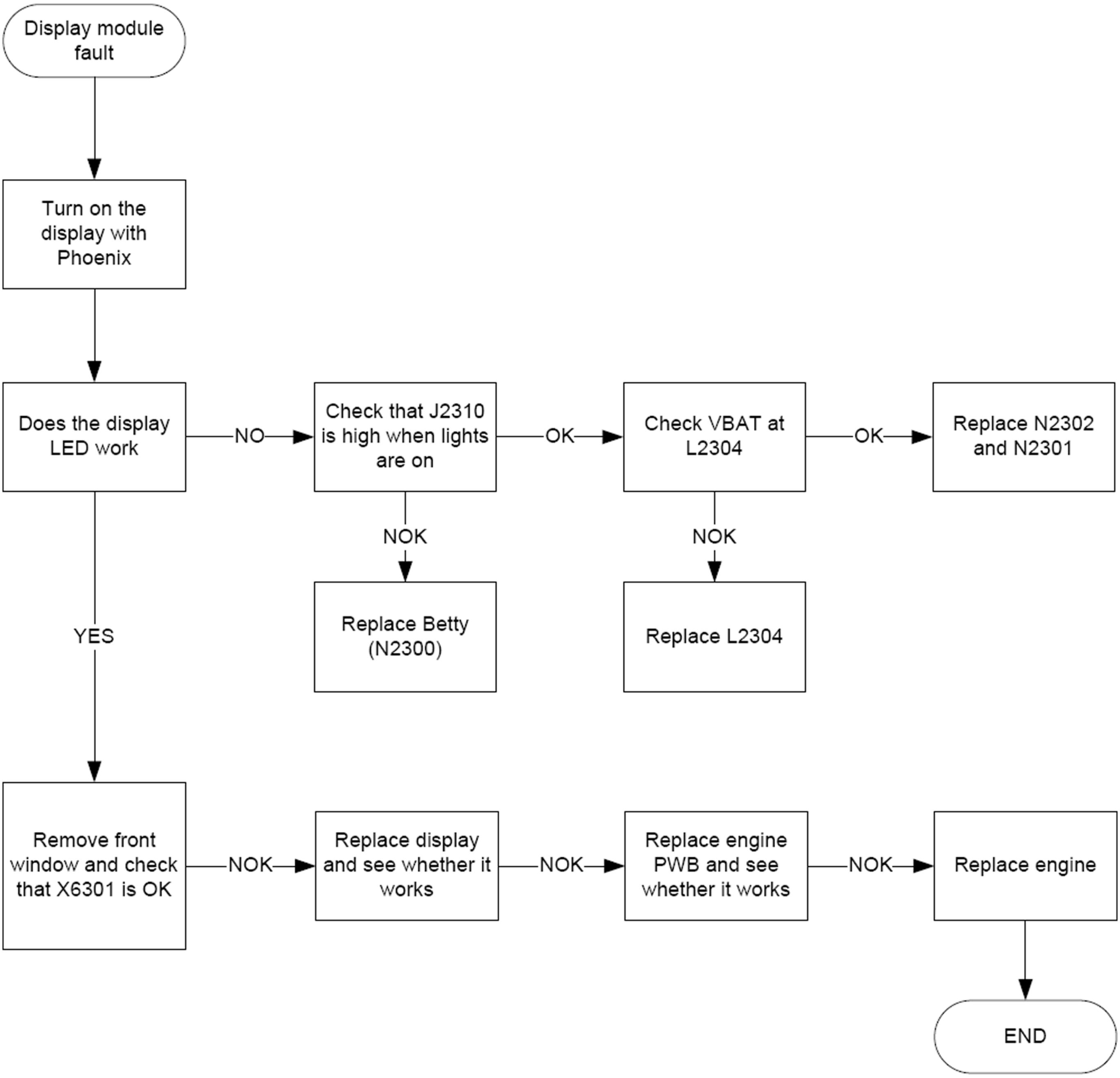
1. Verify with a working display that the fault is not on the display module itself.

   The display module cannot be repaired.
2. Check that the cellular engine is working normally.
   - i To check the functionality, connect the phone to a docking station.
   - ii Start *Phoenix* service software.
   - iii Read the phone information to check that also the application engine is functioning normally (you should be able to read the APE ID).
3. Proceed to the display troubleshooting flowcharts.

   Use the **Display Test** tool in *Phoenix* to find the detailed fault mode.

Display module troubleshooting

Troubleshooting flow


Display module fault
Turn on the display with Phoenix
Does the display LED work
NO
Check that J2310 is high when lights are on
OK
Check VBAT at L2304
OK
Replace N2302 and N2301
NOK
Replace Betty (N2300)
NOK
Replace L2304
YES
Remove front window and check that X6301 is OK
NOK
Replace display and see whether it works
NOK
Replace engine PWB and see whether it works
NOK
Replace engine
END

Ambient Light Sensor troubleshooting and re-calibration

Introduction to ALS troubleshooting and re-calibration

If the Ambient Light Sensor (ALS) functionality is inoperative, check the sensor (N2460) located at the top side of the main PWB. If necessary, change sensor.

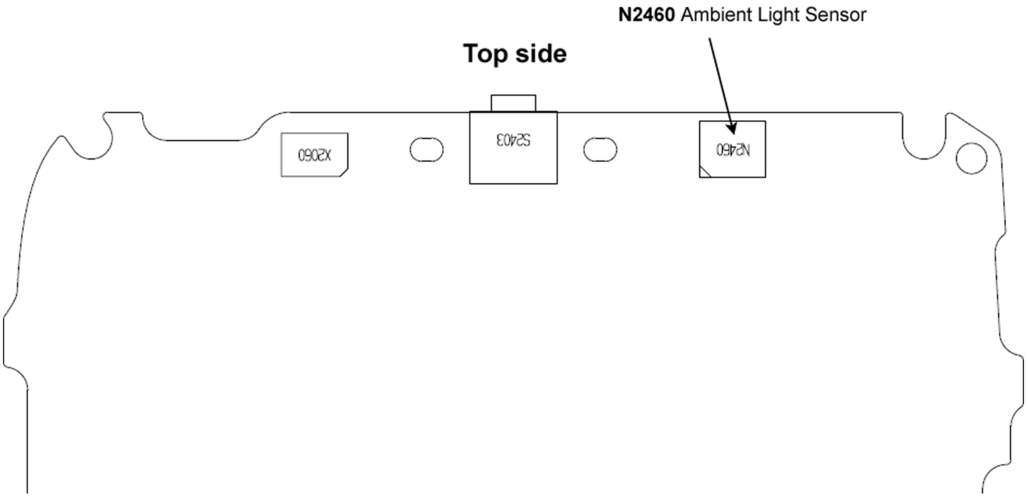


Figure 12 Ambient Light Sensor location

Also, check the ALS light guide located at the top side of the UI shielding assembly.

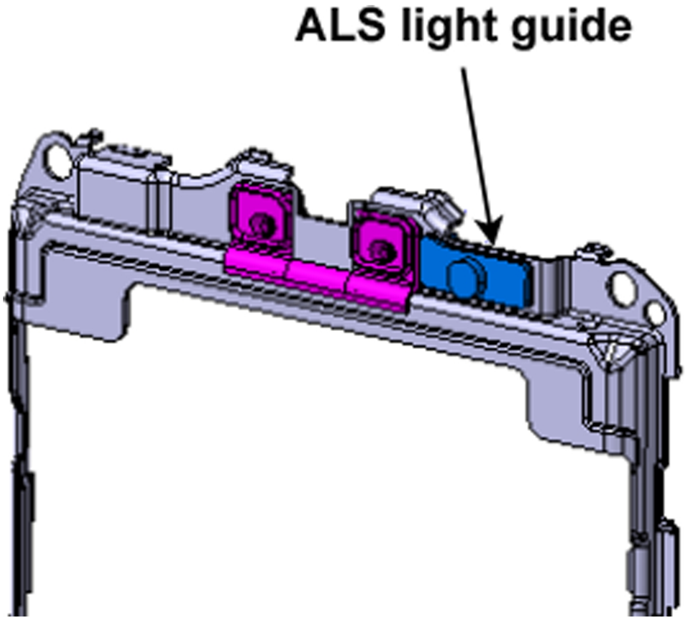


Figure 13 ALS light guide location

After replacing the ALS sensor, or if the calibration values of the sensor are lost or for some other reason, ALS calibration is required. For more information, see ALS functionality check (page 3–23) and Calibrating ALS (page 3–24).

> **Note:** ALS calibration is also required for Light SWAP Engines, because ALS is not factory calibrated for Light SWAP.

When executing the ALS calibration, a reference phone that includes calibrated ALS is required. The ALS re-tuning instructions show why the reference phone is needed.

> **Note:** Make sure that you have completed the display and keyboard backlights troubleshooting before starting the ALS troubleshooting.

There is an Ambient Light Sensor window in the Phoenix Display Test tool, which shows the luminance value. The correct luminance in darkness is <20 lx, and in an office environment 100-2000 lx.

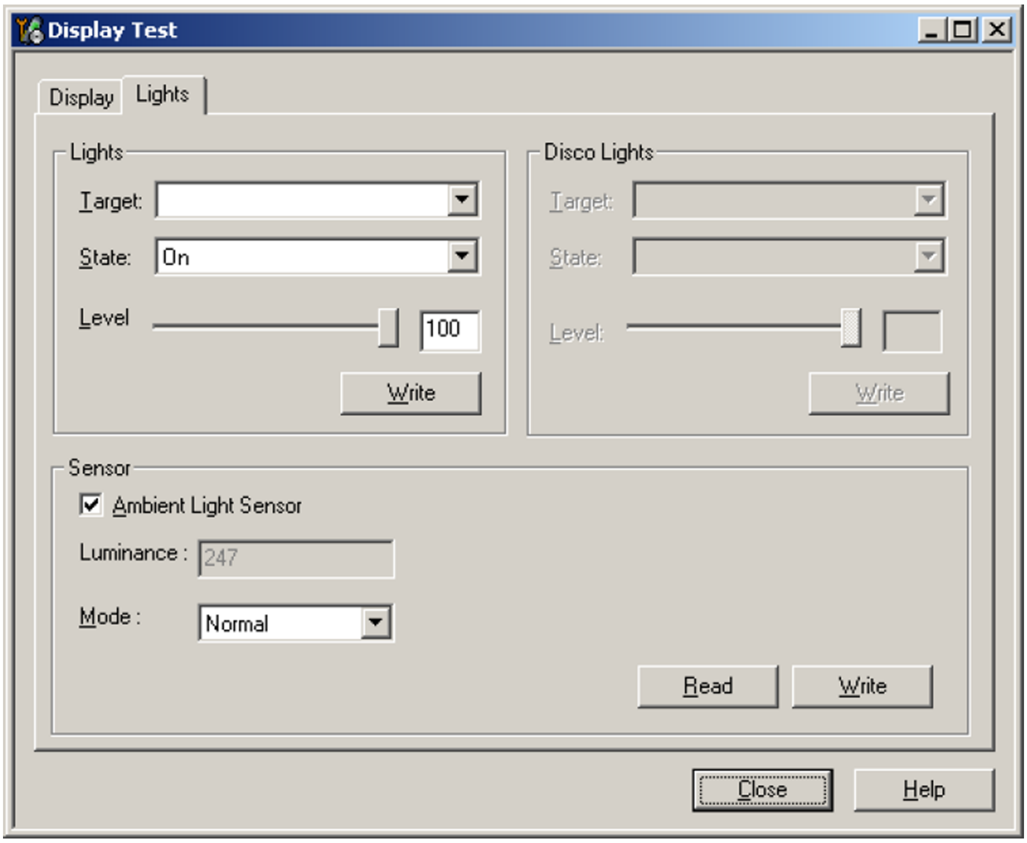
Note: The luminance value depends heavily on the light source and the angle of the phone against the light source, so the values above can only be used as a rough guideline. Phoenix has an ambient light sensor calibration tool for changing the calibration values.

Ambient Light Sensor calibration

ALS functionality check

Steps

1. Connect the phone to *Phoenix*, start the *Phoenix* software, and set the phone (e.g. on the table) so that the ambient light visible to ALS is stable. The light quide of the ALS is located on the upper part of the phone’s front cover, right next to the secondary camera.
2. Scan product on Phoenix (**CTRL+R**)
3. Choose **Testing→Display test.**



State: On

Level 100

☑ Ambient Light Sensor

Luminance : 247

Mode : Normal

4. Open the **Lights** tab, and check the Ambient light sensor check box. Click the **Read** button in order to get the reference ambient light value. Cover the sensor and click **Read** again. When covered, the luminance reading should be less than after clicking **Read** without covering the sensor.

5. If the component does not give any reading or the reading does not change when sensor is/is not covered, replace the part.

   Note: The ALS module is located on the main PWB. ALS calibration must always be done when the main PWB is changed. Also, if the ALS calibration values are lost from the phone, ALS needs to be recalibrated.

   The ALS calibration procedure requires a reference phone with a calibrated ALS.

Calibrating ALS

Context

Before doing the manual ALS calibration, test the following default values:

1 Check the Use default values only box from the **Ambient Light Sensor Calibration** window

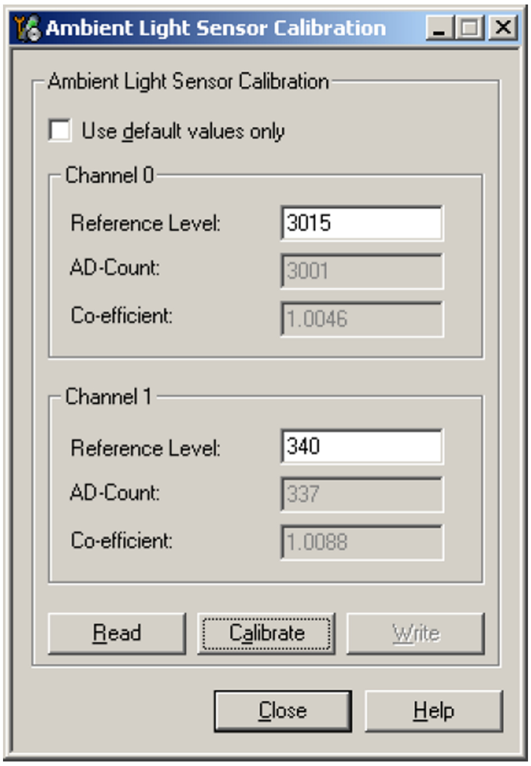
2 Click Write

3 Open the **Display Test** window

4 Read the luminance value from the **Display Test** window. If the luminance value differs a lot (difference max. +- 10%) when compared to the reference phone, perform a manual ALS tuning procedure by following the instructions below.

Steps

1. Connect the phone to *Phoenix*, start the *Phoenix* software, and set the phone (e.g. on the table) so that the ambient light visible to ALS is stable. The light quide of the ALS is located on the upper part of the phone’s front cover, right next to the secondary camera.
2. Scan product on Phoenix (**CTRL+R**)
3. Choose **Tuning→Ambient Light Sensor Calibration.**



Ambient Light Sensor Calibration

Ambient Light Sensor Calibration

☐ Use default values only

Channel 0

Reference Level: 3015

AD-Count: 3001

Co-efficient: 1.0046

Channel 1

Reference Level: 340

AD-Count: 337

Co-efficient: 1.0088

4. Uncheck the Use default values only check box, click the **Read** button to get the AD-Count values for Channel 0 and Channel 1, and write them down.

   Note: In the example graphic the reference phone values are: Channel 0=3001 and Channel 1=337

5. Repeat steps 1-4 for the phone to be calibrated.

   Note: Make sure the phone to be calibrated is located in the same place as the reference phone was when luminance reading was taken.

6. Calculate and write down co-efficient value by division:

$$\text{Co-efficient(CH0)}=\frac{Channel(0)_{(ref.phone)}}{Channel(0)} \quad \text{Co-efficient(CH1)}=\frac{Channel(1)_{(ref.phone)}}{Channel(1)}$$

7. To calibrate ALS, the value in the **Reference Level** textbox needs to be adjusted for both channels until the **Co-efficient** calculated by Phoenix equals the values calculated in step 6. Click **Calibrate** after each try (and uncheck the Use default values only check box).
8. Calibration is done when the **Co-efficient** is equal to the co-efficient value calculated in step 6.

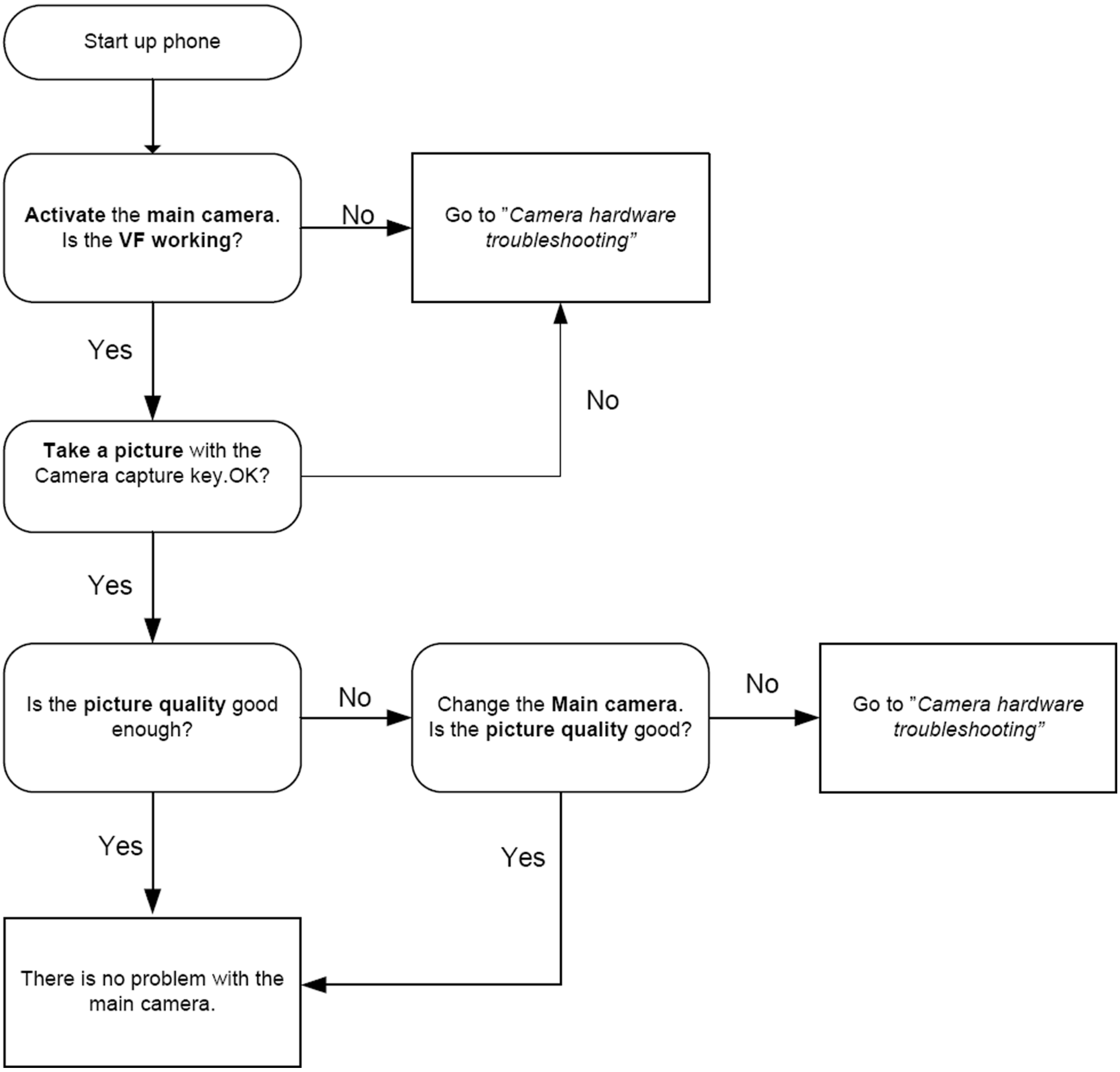
   Note: Decimal numbers should be used in the iteration in order to achieve adequate precision (e.g. 200.2455)
9. Use Phoenix (**Testing**→**Display test**→**Lights** tab) to verify the calibration by reading the luminance value for both the reference phone and calibrated phone.

   Note: Remember that the illuminance readings for the reference and calibrated phones must be done in the same ambient light conditions. If the illuminance values differ more than +- 10%, repeat the whole ALS calibration procedure.
10. To end the calibration, click Close.

Camera troubleshooting

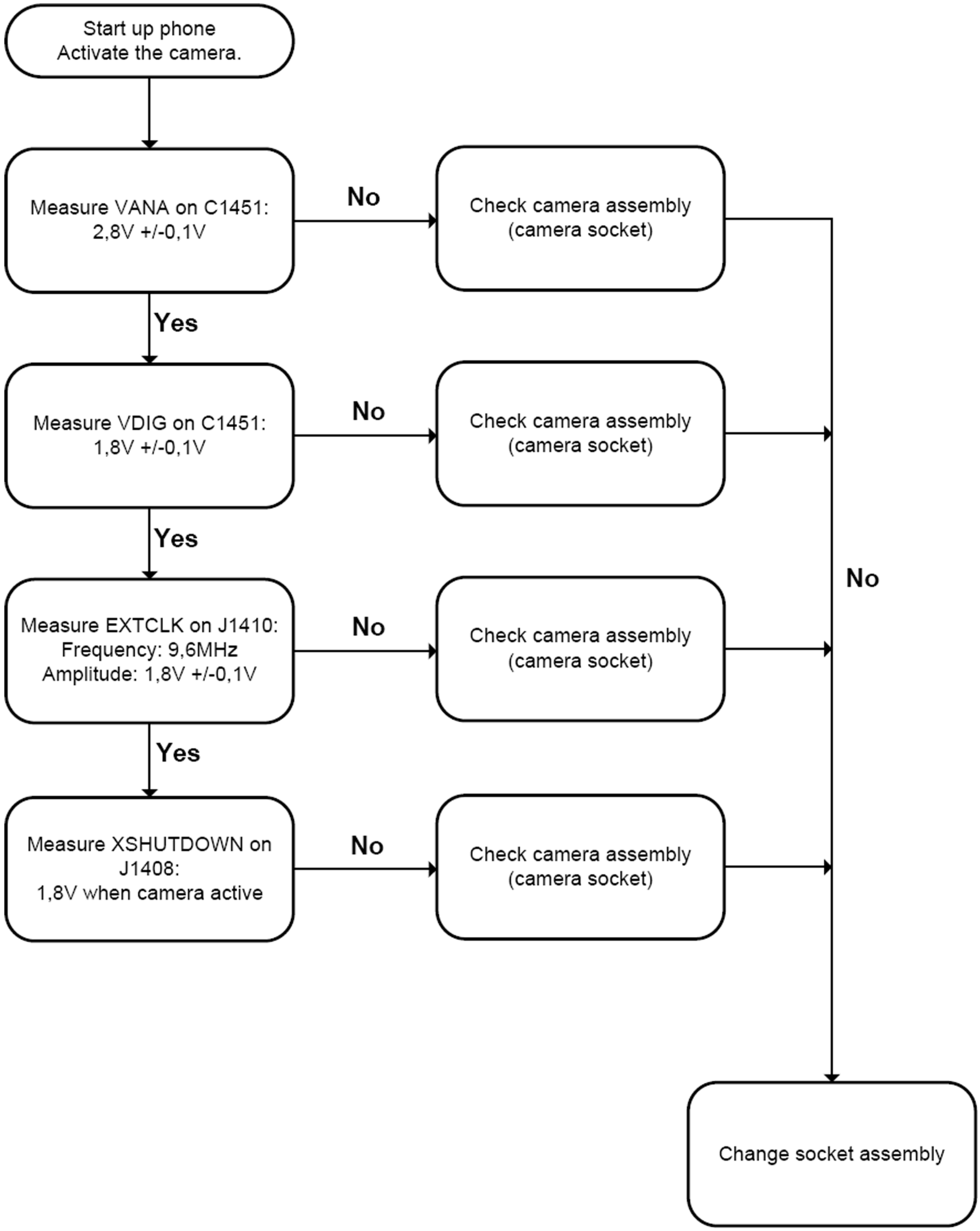
Camera troubleshooting

Troubleshooting flow


Start up phone
Activate the main camera. Is the VF working?
No
Go to "Camera hardware troubleshooting"
Yes
No
Take a picture with the Camera capture key.OK?
Yes
Is the picture quality good enough?
No
Change the Main camera. Is the picture quality good?
No
Go to "Camera hardware troubleshooting"
Yes
Yes
There is no problem with the main camera.

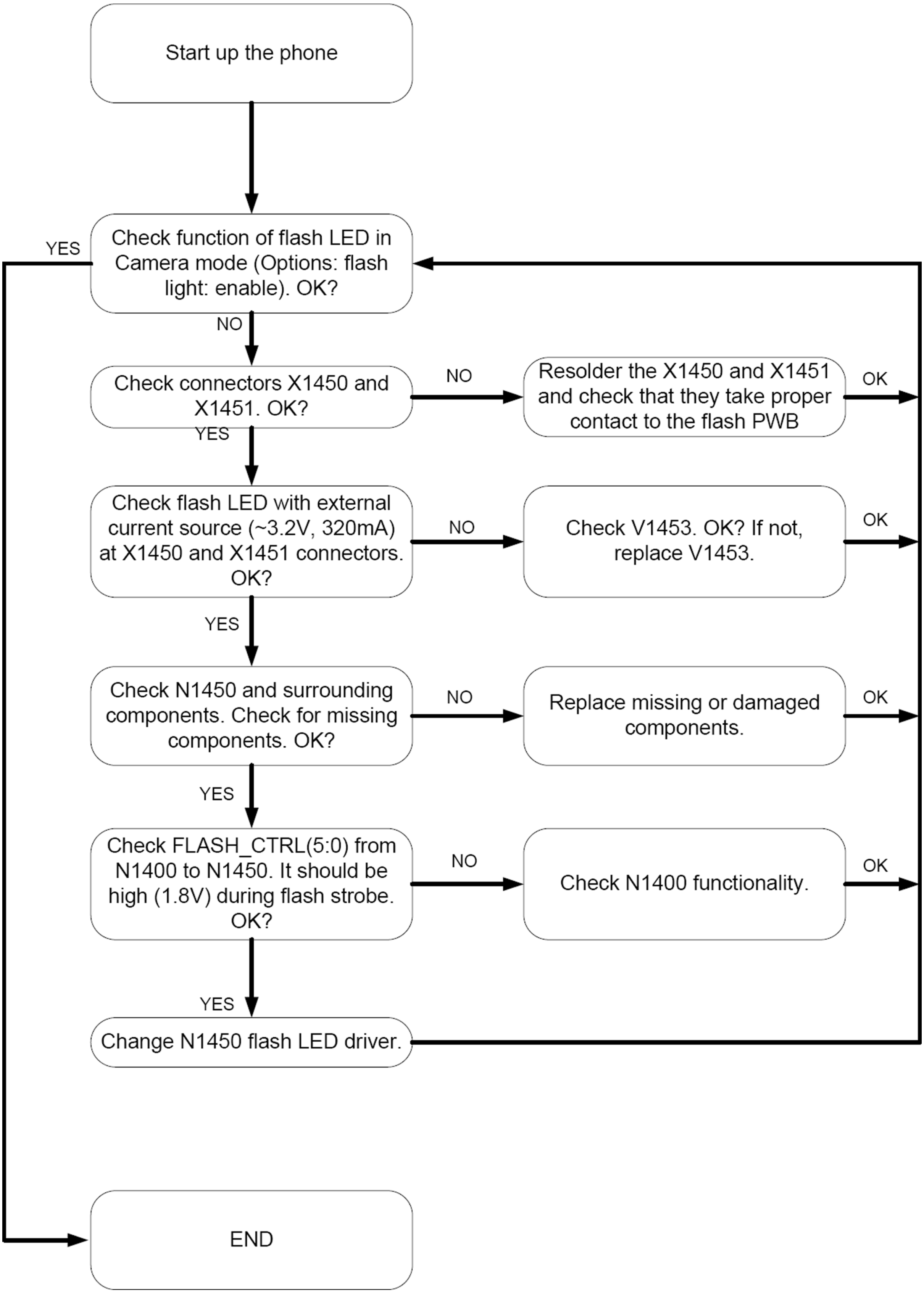
Camera hardware troubleshooting

Troubleshooting flow


Start up phone
Activate the camera.
Measure VANA on C1451:
2,8V +/-0,1V
No
Check camera assembly
(camera socket)
Yes
Measure VDIG on C1451:
1,8V +/-0,1V
No
Check camera assembly
(camera socket)
Yes
Measure EXTCLK on J1410:
Frequency: 9,6MHz
Amplitude: 1,8V +/-0,1V
No
Check camera assembly
(camera socket)
Yes
Measure XSHUTDOWN on
J1408:
1,8V when camera active
No
Check camera assembly
(camera socket)
No
Change socket assembly

Camera flash LED troubleshooting

Troubleshooting flow


Start up the phone
Check function of flash LED in Camera mode (Options: flash light: enable). OK?
YES
NO
Check connectors X1450 and X1451. OK?
NO
Resolder the X1450 and X1451 and check that they take proper contact to the flash PWB
OK
YES
Check flash LED with external current source (~3.2V, 320mA) at X1450 and X1451 connectors. OK?
NO
Check V1453. OK? If not, replace V1453.
OK
YES
Check N1450 and surrounding components. Check for missing components. OK?
NO
Replace missing or damaged components.
OK
YES
Check FLASH_CTRL(5:0) from N1400 to N1450. It should be high (1.8V) during flash strobe. OK?
NO
Check N1400 functionality.
OK
YES
Change N1450 flash LED driver.
END

Audio troubleshooting

Audio troubleshooting test instructions

Single-ended external earpiece and differential internal earpiece outputs can be measured either with a single-ended or a differential probe.

When measuring with a single-ended probe each output is measured against the ground.

Internal handsfree output is measured using a current probe, if a special low-pass filter designed for measuring a digital amplifier is not available. Note also that when using a current probe, the input signal frequency must be set to 2kHz.

The input signal for each loop test can be either single-ended or differential. Exception to this is a digital microphone, which needs input signal from an external sound source (laptop speaker) to playback eg. 1kHz sine wave from 5cm distance.

Required equipment

The following equipment is needed for the tests:

- Oscilloscope
- Function generator (sine waveform)
- Current probe (Internal handsfree PWM output measurement)
- Phoenix service software
- Battery voltage 3.7V
- Sound source (laptop speaker or B&K type 4231 calibrator)

Test procedure

Audio can be tested using the Phoenix audio routings option. Three different audio loop paths can be activated:

- External microphone to Internal earpiece
- External microphone to Internal handsfree speaker
- Digital stereo microphone to External earpiece

Each audio loop sets routing from the specified input to the specified output enabling a quick in-out test. Loop path gains are fixed and they cannot be changed using Phoenix. Correct pins and signals for each test are presented in the following table.

Phoenix audio loop tests and test results

The results presented in the table apply when no accessory is connected and battery voltage is set to 3.7V.

Earpiece, internal microphone and speaker are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

The gain values presented in the table apply for a differential output vs. single-ended/differential input.

Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage [mVp-p]	Output voltage [mVp-p]	Output DC level [V]	Output current [mA]
External Mic to External Earpiece	HS_MIC & GND	HS_EAR_L & GND	12	140	1.9Vpp	1.2	NA
		HS_EAR_R & GND					
External Mic to Internal Earpiece	HS_MIC & GND	EarP & GND	0	100	100	1.2	NA
		EarN & GND					
External Mic to Internal handsfree	HS_MIC & GND	J2103 & J2104	6	200	500		
		J2101 & J2102					
Digital Mic to External Earpiece	Acoustical input, 1kHz sine wave	HS_EAR_L & GND	NA	94 dB SPL	100		NA
		HS_EAR_R & GND					

Measurement data

Earpiece signal

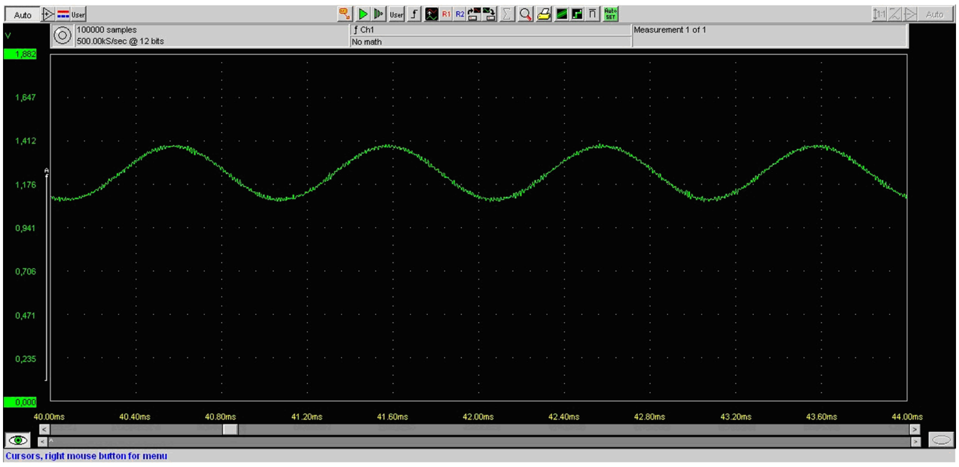

Auto
User
100000 samples
500.00kS/sec @ 12 bits
Ch1
No math
Measurement 1 of 1
Auto
V
1,882
1,647
1,412
1,176
0,941
0,706
0,471
0,235
0,000
40.00ms
40.40ms
40.80ms
41.20ms
41.60ms
42.00ms
42.40ms
42.80ms
43.20ms
43.60ms
44.00ms
Cursors, right mouse button for menu

Figure 14 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected.

Integrated handsfree signal

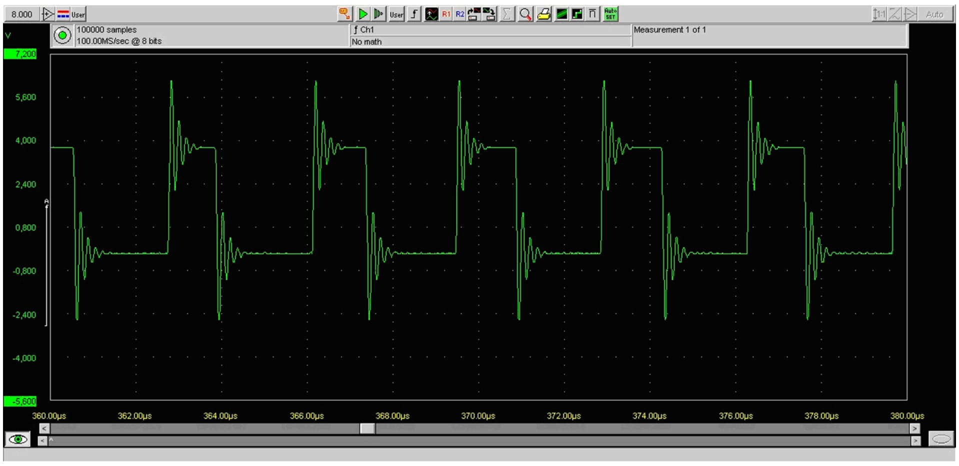

8.000
User
100000 samples
100.00MS/sec @ 8 bits
ƒ Ch1
No math
Measurement 1 of 1
Auto
V
7,200
5,600
4,000
2,400
0,800
-0,800
-2,400
-4,000
-5,600
360.00µs
362.00µs
364.00µs
366.00µs
368.00µs
370.00µs
372.00µs
374.00µs
376.00µs
378.00µs
380.00µs

Figure 15 Single-ended output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected (measured at speaker pads). No filter is used.

External output from AV

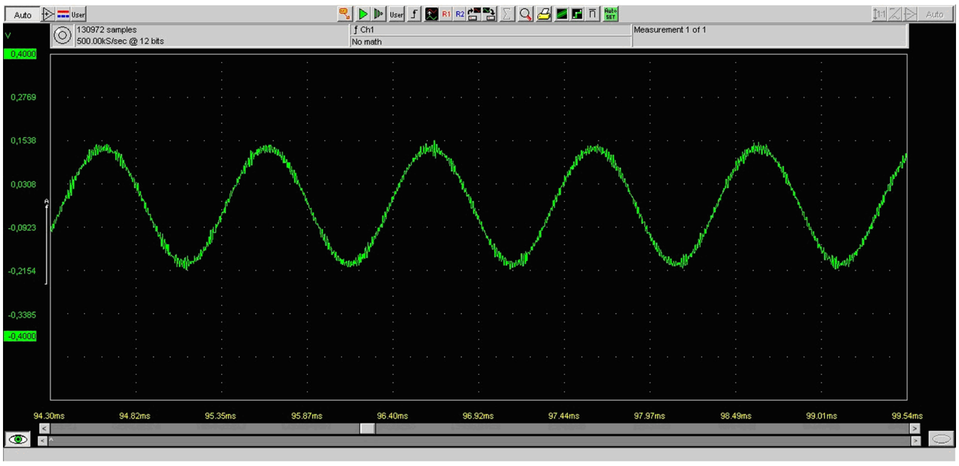

Auto
User
130972 samples
500.00kS/sec @ 12 bits
ƒ Ch1
No math
Measurement 1 of 1
Auto
V
0,4000
0,2769
0,1538
0,0308
-0,0923
-0,2154
-0,3385
-0,4000
94.30ms
94.82ms
95.35ms
95.87ms
96.40ms
96.92ms
97.44ms
97.97ms
98.49ms
99.01ms
99.54ms

Figure 16 Single-ended output waveform of the Ext_in_Ext_out loop.

External output from AV (acoustic input)

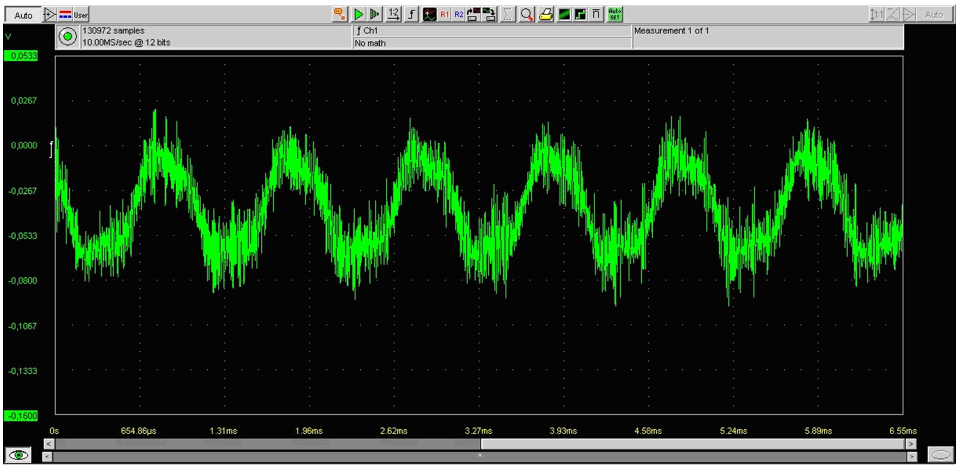
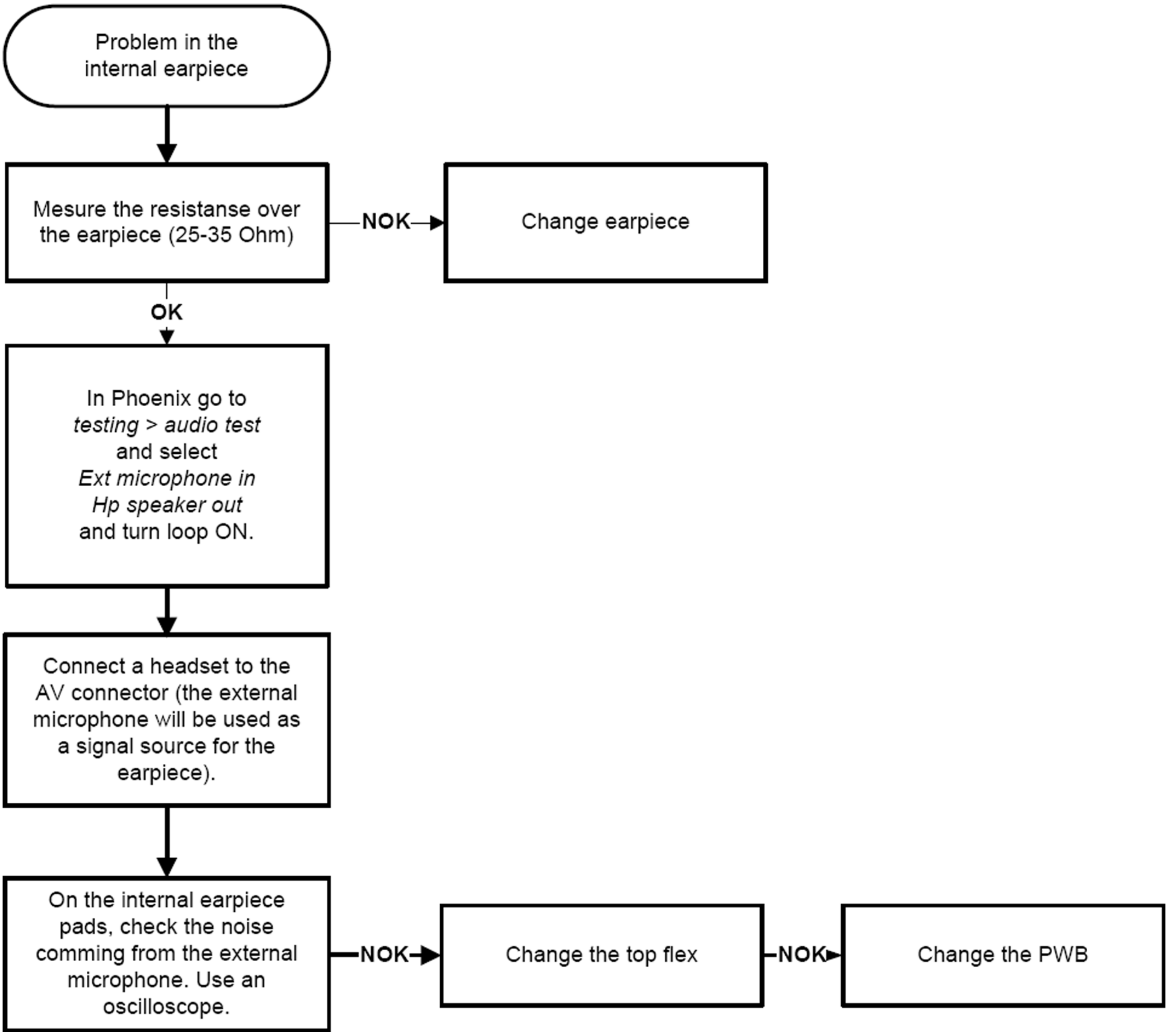

Auto
User
130972 samples
10.00MS/sec @ 12 bits
ƒ Ch1
No math
Measurement 1 of 1
Auto
V
0,0533
0,0267
0,0000
-0,0267
-0,0533
-0,0800
-0,1067
-0,1333
-0,1600
0s
654.86µs
1.31ms
1.96ms
2.62ms
3.27ms
3.93ms
4.58ms
5.24ms
5.89ms
6.55ms

Figure 17 Single-ended output waveform of the Digital_stereo_microphone_in_Ext_out loop.

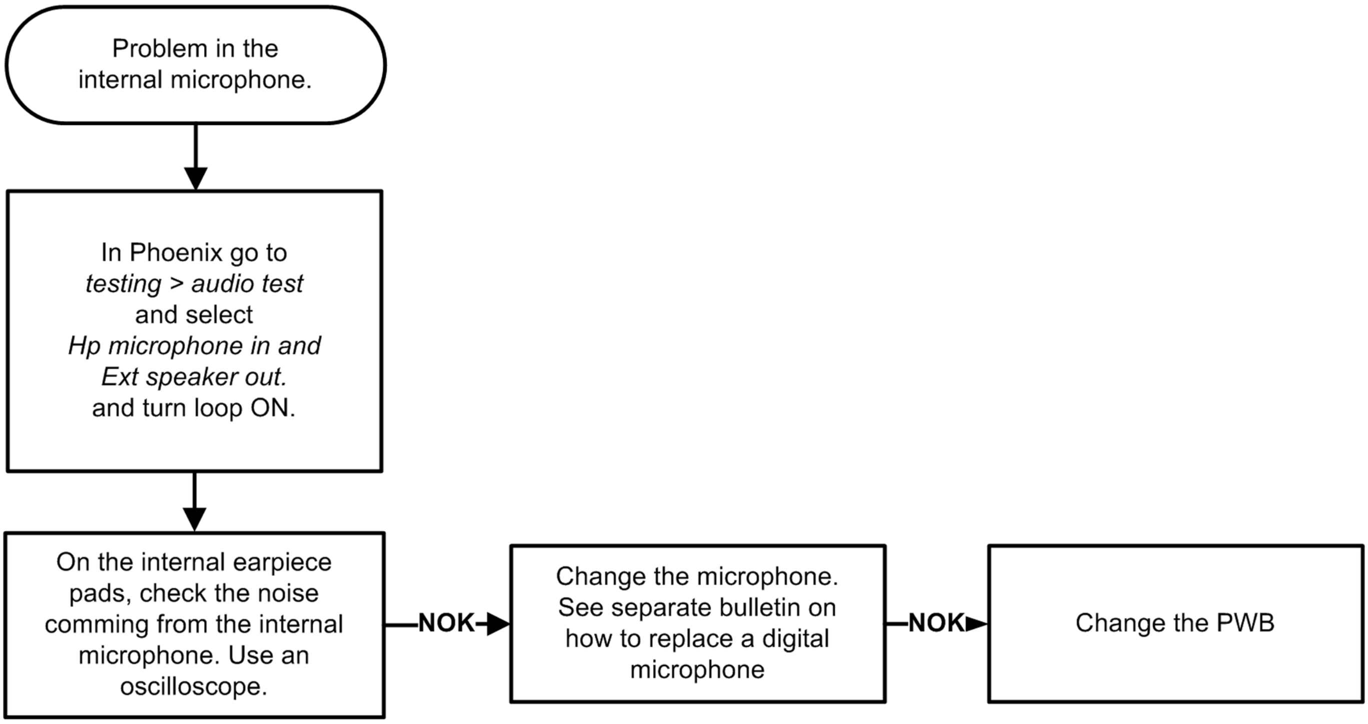
Internal earpiece troubleshooting

Troubleshooting flow


Problem in the internal earpiece
Mesure the resistanse over the earpiece (25-35 Ohm)
NOK
Change earpiece
OK
In Phoenix go to *testing > audio test* and select *Ext microphone in Hp speaker out* and turn loop ON.
Connect a headset to the AV connector (the external microphone will be used as a signal source for the earpiece).
On the internal earpiece pads, check the noise comming from the external microphone. Use an oscilloscope.
NOK
Change the top flex
NOK
Change the PWB

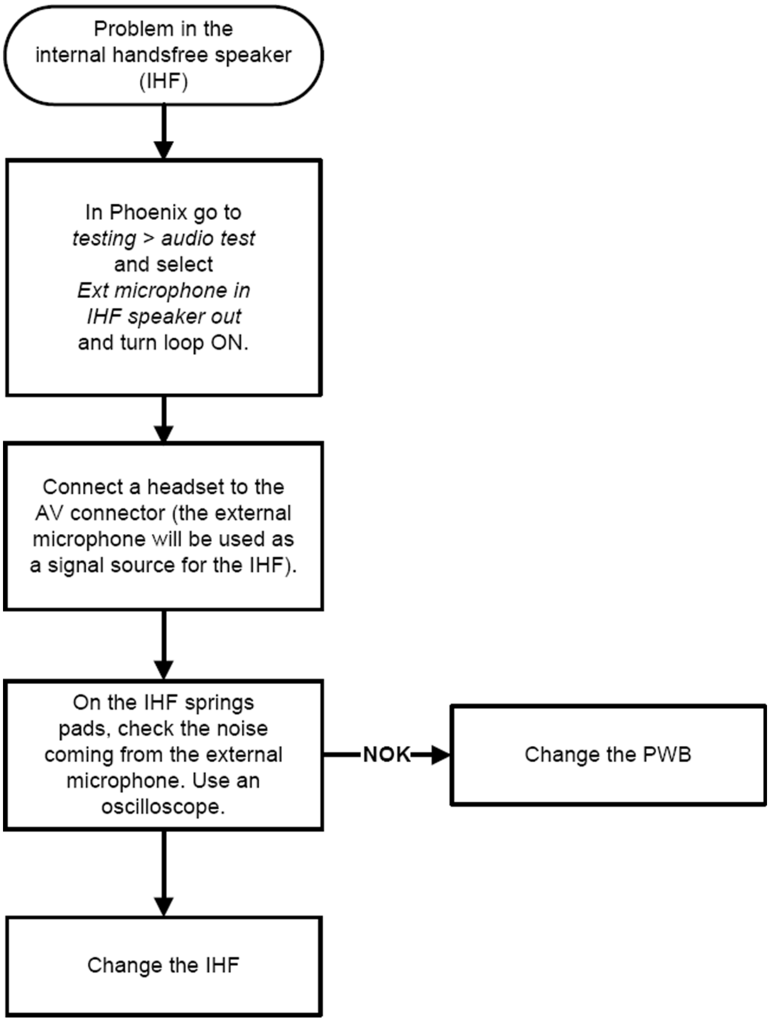
Internal microphone troubleshooting

Troubleshooting flow


Problem in the internal microphone.
In Phoenix go to *testing > audio test* and select *Hp microphone in and Ext speaker out.* and turn loop ON.
On the internal earpiece pads, check the noise comming from the internal microphone. Use an oscilloscope.
NOK
Change the microphone. See separate bulletin on how to replace a digital microphone
NOK
Change the PWB

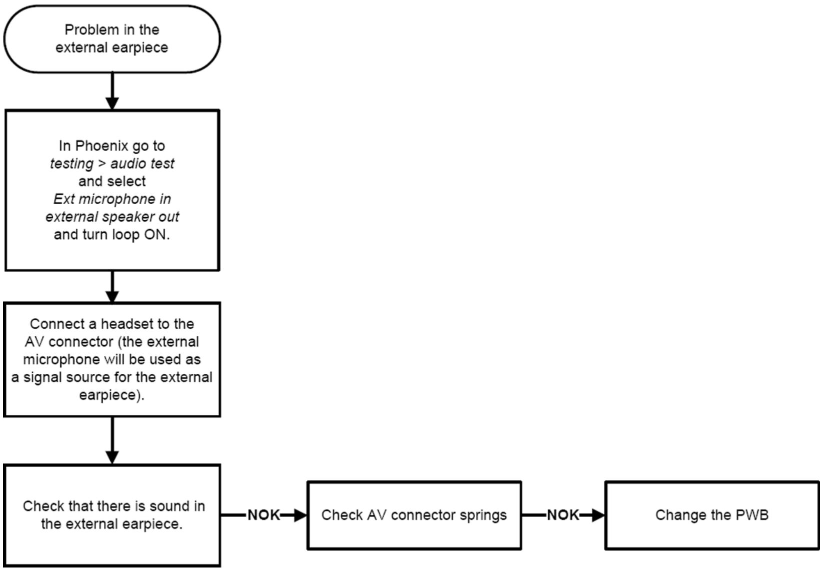
Internal handsfree (IHF) troubleshooting

Troubleshooting flow


Problem in the internal handsfree speaker (IHF)
In Phoenix go to *testing > audio test* and select *Ext microphone in IHF speaker out* and turn loop ON.
Connect a headset to the AV connector (the external microphone will be used as a signal source for the IHF).
On the IHF springs pads, check the noise coming from the external microphone. Use an oscilloscope.
NOK
Change the PWB
Change the IHF

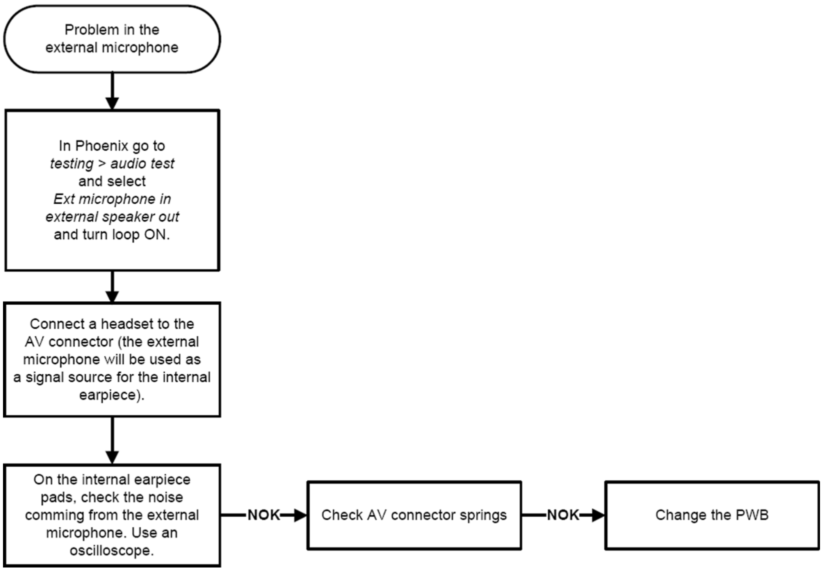
External earpiece troubleshooting

Troubleshooting flow


Problem in the external earpiece
In Phoenix go to *testing > audio test* and select *Ext microphone in external speaker out* and turn loop ON.
Connect a headset to the AV connector (the external microphone will be used as a signal source for the external earpiece).
Check that there is sound in the external earpiece.
NOK
Check AV connector springs
NOK
Change the PWB

External microphone troubleshooting

Troubleshooting flow


Problem in the external microphone
In Phoenix go to *testing > audio test* and select *Ext microphone in external speaker out* and turn loop ON.
Connect a headset to the AV connector (the external microphone will be used as a signal source for the internal earpiece).
On the internal earpiece pads, check the noise comming from the external microphone. Use an oscilloscope.
NOK
Check AV connector springs
NOK
Change the PWB

Acoustics troubleshooting

Introduction to acoustics troubleshooting

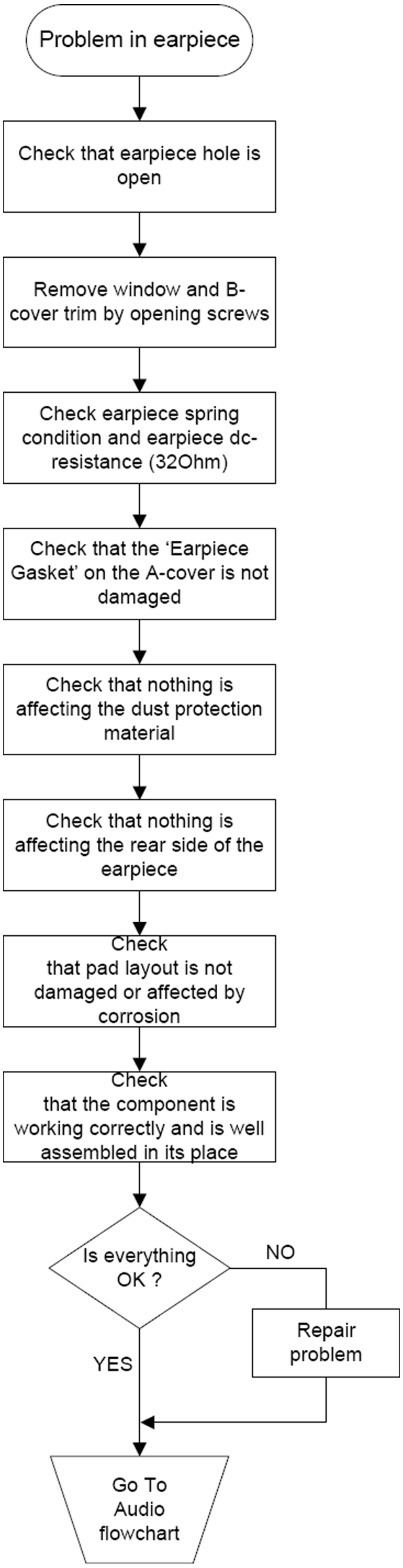
Acoustics design ensures that the sound is detected correctly with a microphone and properly radiated to the outside of the device by speaker(s). The acoustics of the phone includes three basic systems: earpiece, Integrated Hands Free (IHF) and microphone.

The sound reproduced from the earpiece radiates through a single hole on the front cover (A-cover). The sound reproduced from the IHF speaker (located under the battery cover) radiates from the sound holes on the battery cover. The microphone is located inside the fold (in the lower block) at the bottom right corner.

For a correct functionality of the phone, all sound holes must be always open. When the phone is used, care must be taken not to close any of those holes with a hand or fingers. The phone should be dry and clean, and no objects must be located in such a way that they close any of the holes.

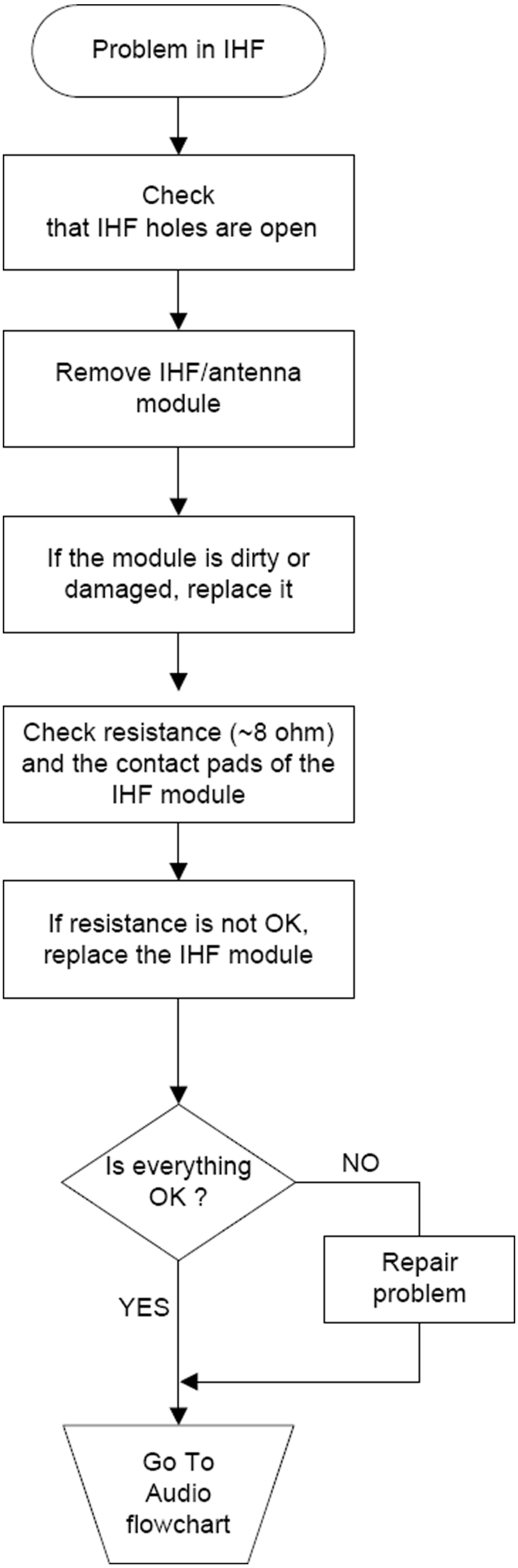
Earpiece troubleshooting

Troubleshooting flow


Problem in earpiece
Check that earpiece hole is open
Remove window and B-cover trim by opening screws
Check earpiece spring condition and earpiece dc-resistance (32Ohm)
Check that the 'Earpiece Gasket' on the A-cover is not damaged
Check that nothing is affecting the dust protection material
Check that nothing is affecting the rear side of the earpiece
Check that pad layout is not damaged or affected by corrosion
Check that the component is working correctly and is well assembled in its place
Is everything OK ?
NO
Repair problem
YES
Go To Audio flowchart

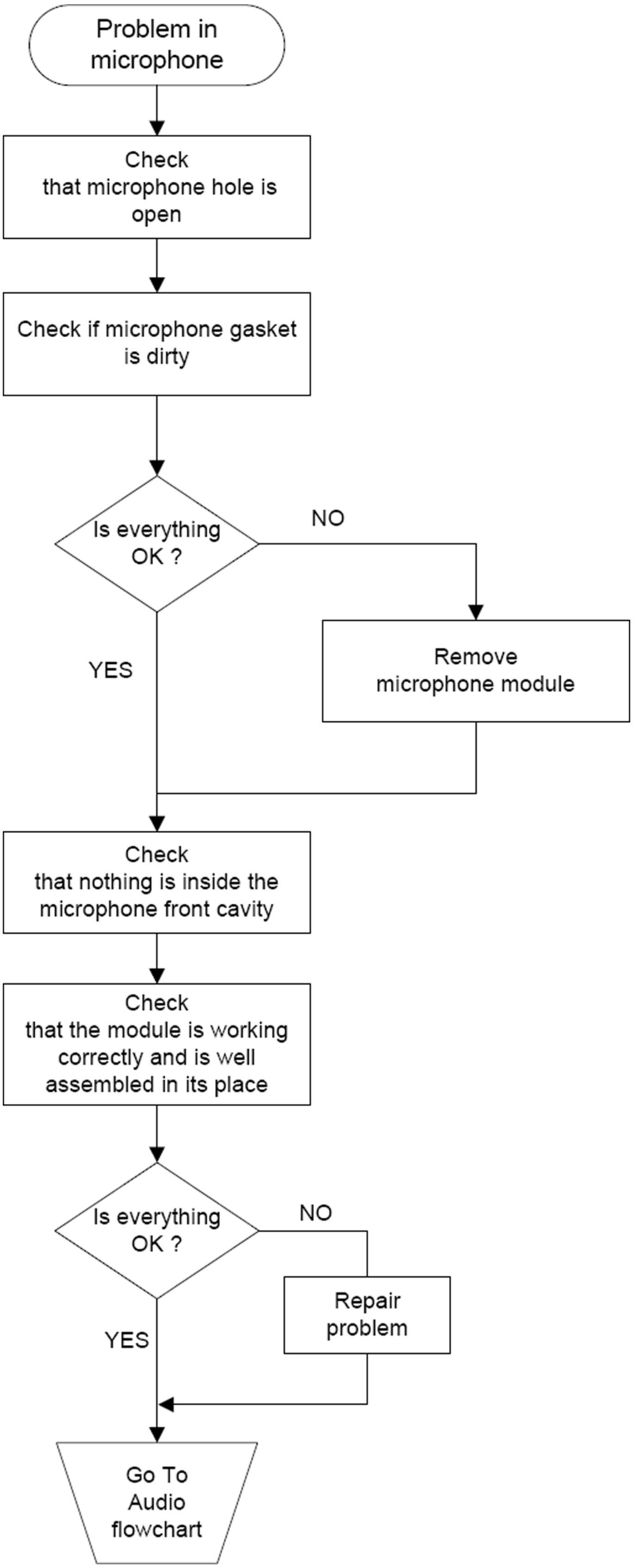
IHF troubleshooting

Troubleshooting flow


Problem in IHF
Check that IHF holes are open
Remove IHF/antenna module
If the module is dirty or damaged, replace it
Check resistance (~8 ohm) and the contact pads of the IHF module
If resistance is not OK, replace the IHF module
Is everything OK ?
NO
Repair problem
YES
Go To Audio flowchart

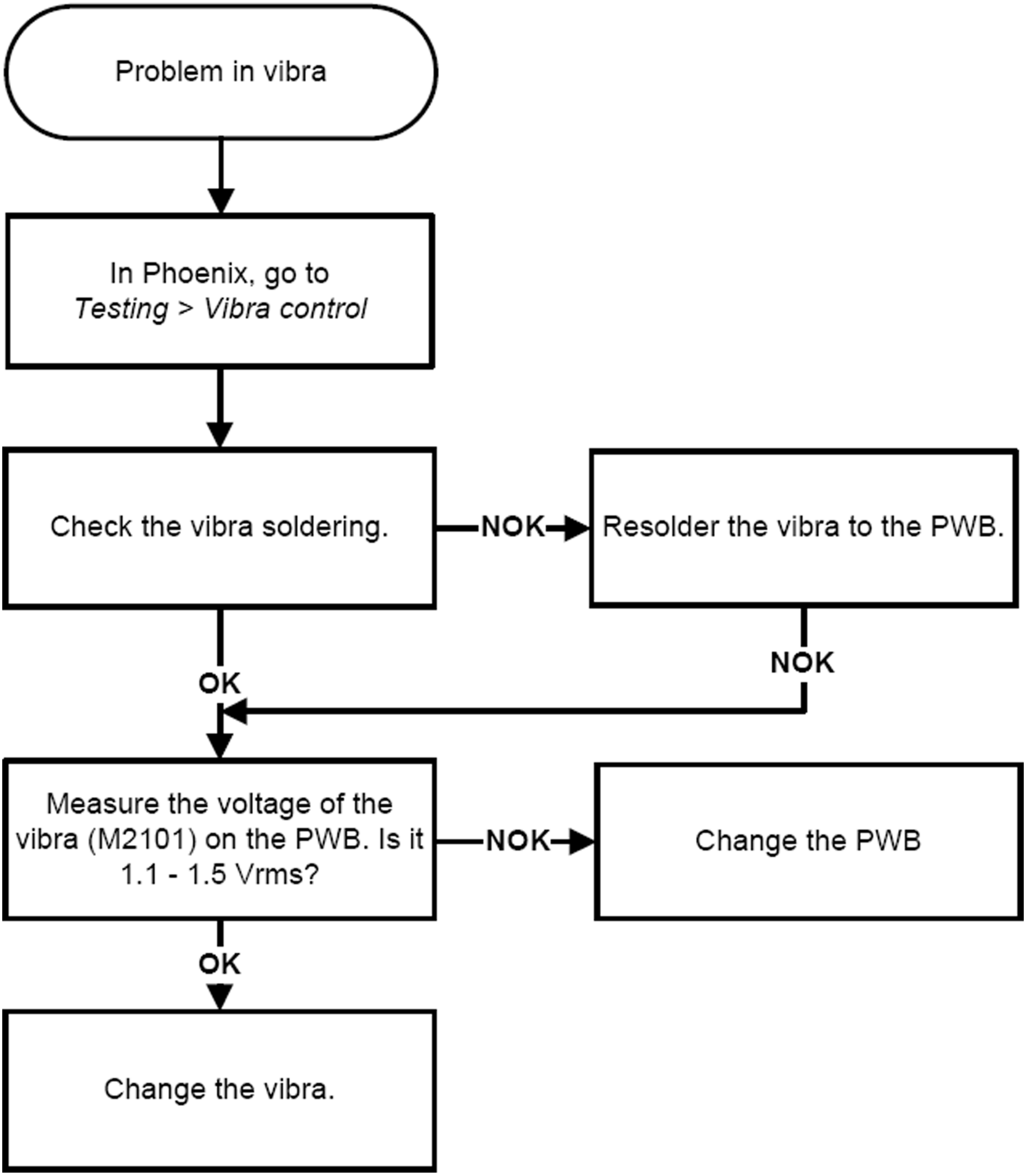
Microphone troubleshooting

Troubleshooting flow


Problem in microphone
Check that microphone hole is open
Check if microphone gasket is dirty
Is everything OK ?
NO
Remove microphone module
YES
Check that nothing is inside the microphone front cavity
Check that the module is working correctly and is well assembled in its place
Is everything OK ?
NO
Repair problem
YES
Go To Audio flowchart

Vibra troubleshooting

Troubleshooting flow


Problem in vibra
In Phoenix, go to
Testing > Vibra control
Check the vibra soldering.
NOK
Resolder the vibra to the PWB.
NOK
OK
Measure the voltage of the vibra (M2101) on the PWB. Is it 1.1 - 1.5 Vrms?
NOK
Change the PWB
OK
Change the vibra.

Bluetooth and FM radio troubleshooting

Introduction to Bluetooth/FM Radio troubleshooting

There are two main Bluetooth problems that can occur:

Problem	Description
Detachment of the BT antenna.	This would most likely happen if the device has been dropped repeatedly to the ground. It could cause the BT antenna to become loose or partially detached from the PWB.
A malfunction in the BT ASIC, BB ASICs or Phone's BT SMD components.	This is unpredictable and could have many causes i.e. SW or HW related.

The main issue is to find out if the problem is related to the BT antenna or related to the BT system or the phone's BB and then replace/fix the faulty component.

Bluetooth antenna

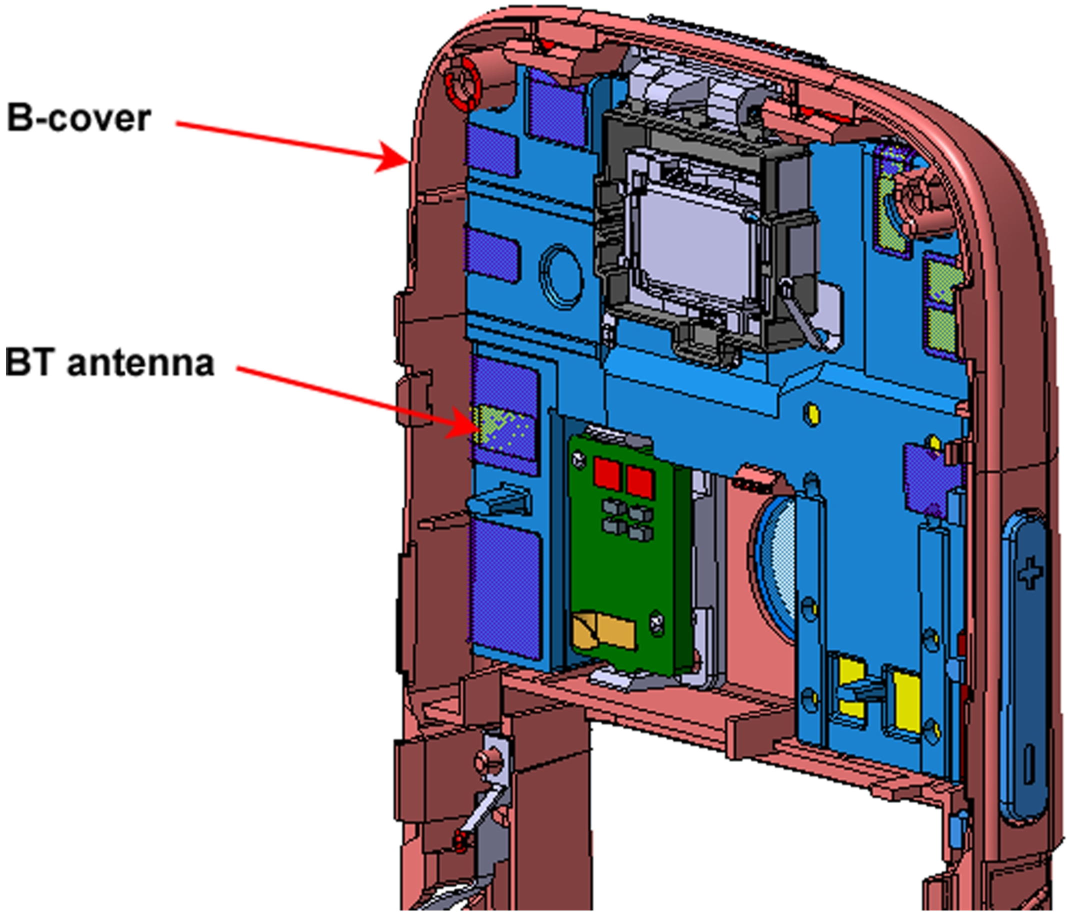


Figure 18 Bluetooth antenna location

Bluetooth/FM Radio component layout

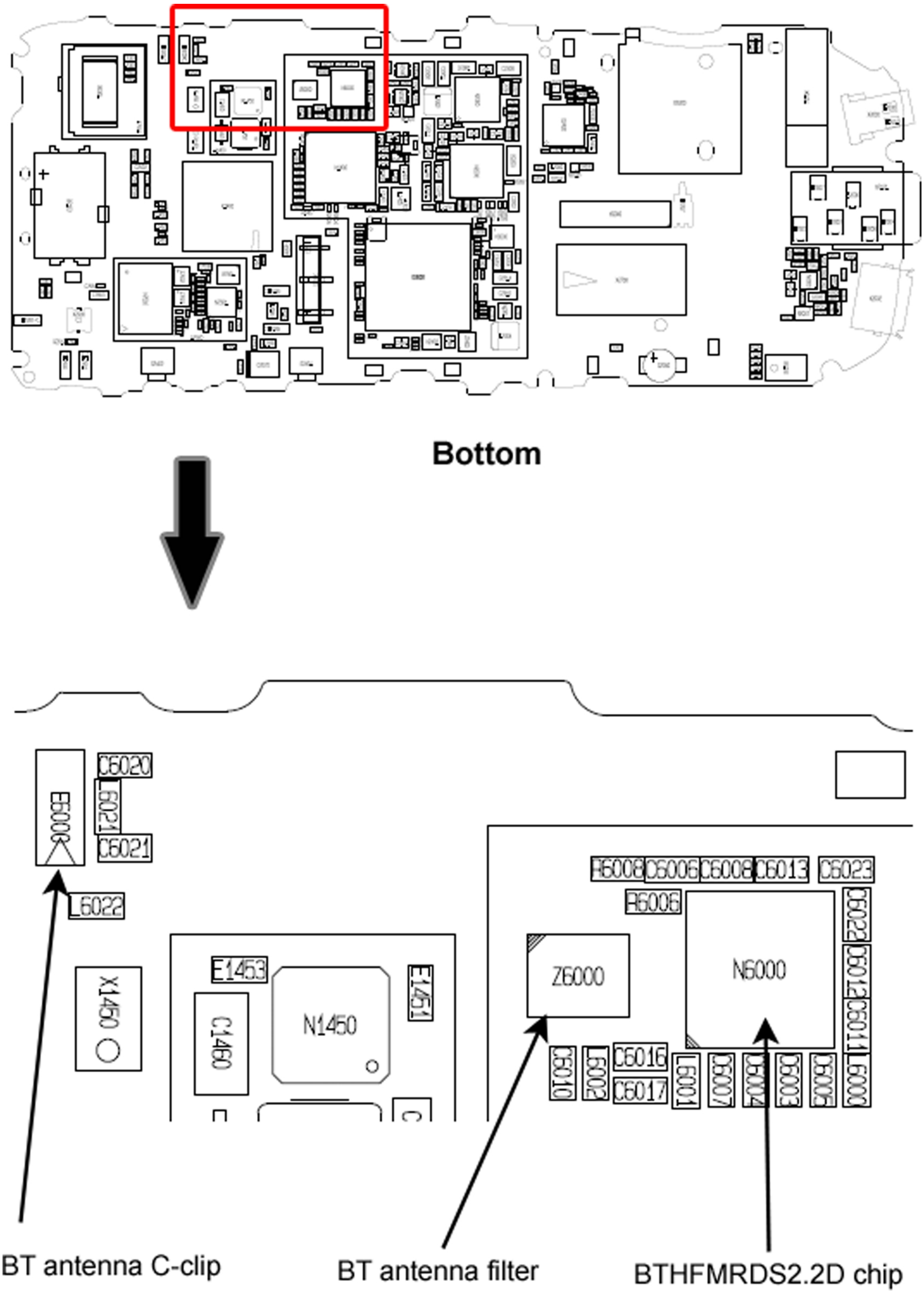

Bottom
C6020
L6021
E6000
C6021
L6022
X1450
E1453
C1460
N1450
E1451
R6008
C6006
C6008
C6013
C6023
R6006
Z6000
N6000
C6022
C6012
C6011
L6000
C6010
L6002
C6016
C6017
L6001
C6007
C6004
C6003
C6005
BT antenna C-clip
BT antenna filter
BTHFMRDS2.2D chip

Figure 19 Bluetooth and FM radio component layout

Bluetooth settings for Phoenix

Steps

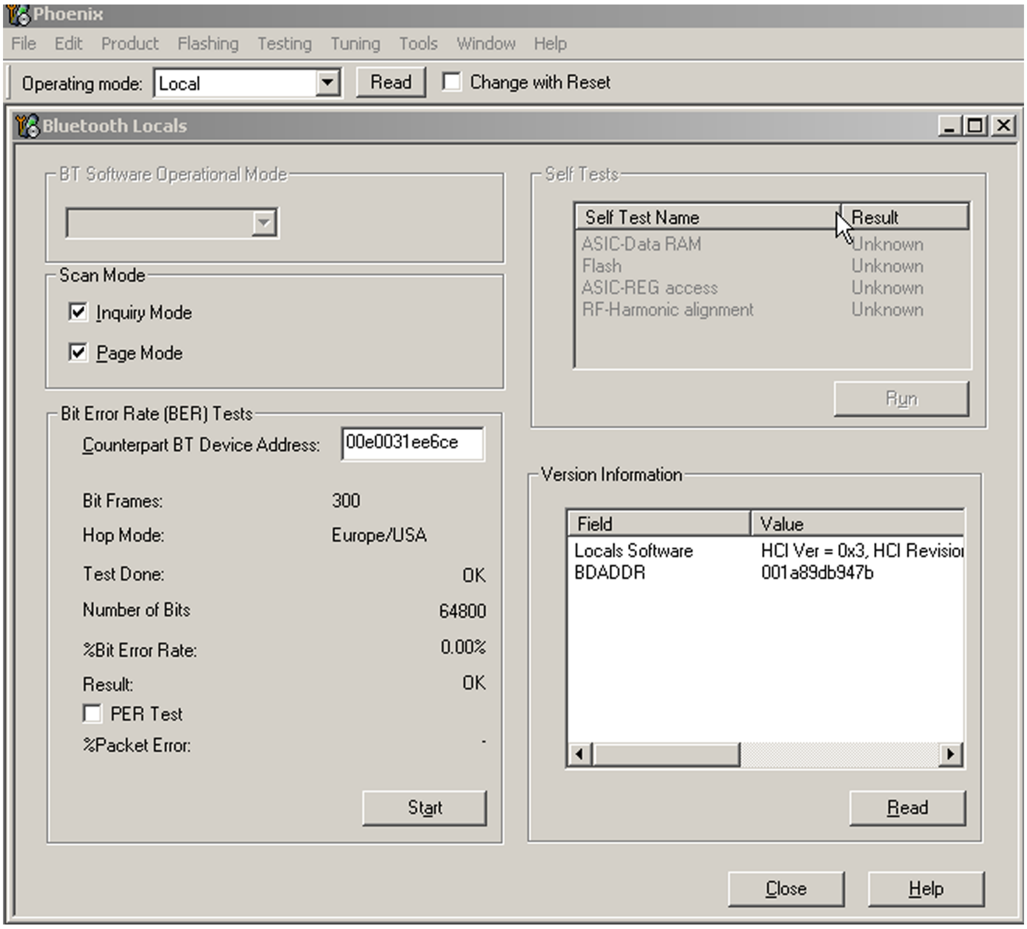
1. Start *Phoenix* service software.
2. Place the phone to a flash adapter in the local mode.
3. From the **File** menu, choose **Open Product**, and then choose the correct type designator from the **Product** list.
4. Choose **Testing→Bluetooth LOCALS** .
5. Locate SB-6’s serial number (12 digits) found in the type label on the back of SB-6.

   In addition to SB-6 , also JBT-3, JBT-6 and JBT-9 Bluetooth test boxes can be used.
6. In the *Bluetooth LOCALS* window, write the 12-digit serial number on the **Counterpart BT Device Address** line.

   This needs to be done only once provided that SB-6 is not changed.
7. Place the SB-6 box near (within 10 cm) the BT antenna and click **Run BER Test**.

Results

Bit Error Rate test result is displayed in the *Bit Error Rate (BER) Tests* pane in the *Bluetooth LOCALS* window.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
Read
Bluetooth Locals
BT Software Operational Mode
Scan Mode
Bit Error Rate (BER) Tests
Self Tests
Run
Version Information
Start
Read
Close
Help

Operating mode: Local
☐ Change with Reset

☑ Inquiry Mode
☑ Page Mode

Counterpart BT Device Address: 00e0031ee6ce
Bit Frames: 300
Hop Mode: Europe/USA
Test Done: OK
Number of Bits 64800
%Bit Error Rate: 0.00%
Result: OK
☐ PER Test
%Packet Error: -

Self Test Name	Result
ASIC-Data RAM	Unknown
Flash	Unknown
ASIC-REG access	Unknown
RF-Harmonic alignment	Unknown

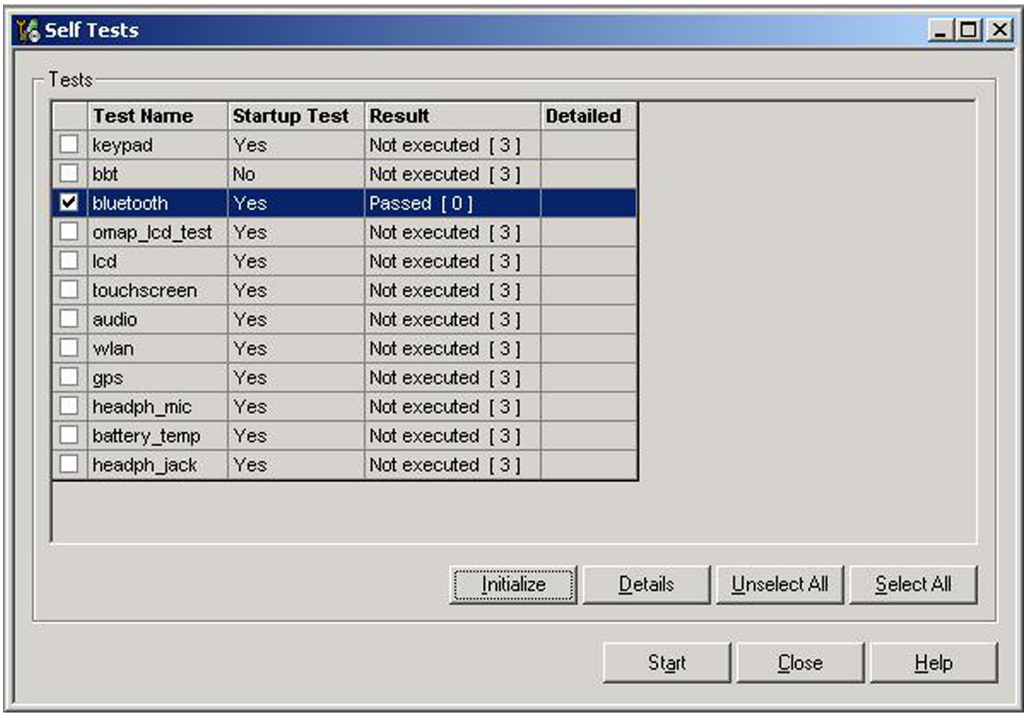
Field	Value
Locals Software	HCI Ver = 0x3, HCI Revisio
BDADDR	001a89db947b

Figure 20 BER test result

Bluetooth self tests in Phoenix

Steps

1. Start *Phoenix* service software.
2. Choose**File→Scan Product.**
3. Place the phone to a flash adapter.
4. From the **Mode** drop-down menu, set mode to **Local**.
5. Choose **Testing→Self Tests.**
6. In the *Self Tests* window check the following Bluetooth related tests:
    - **ST_LPRF_IF_TEST**
    - **ST_LPRF_AUDIO_LINES_TEST**
    - **ST_BT_WAKEUP_TEST**
7. To run the tests, click **Start**.

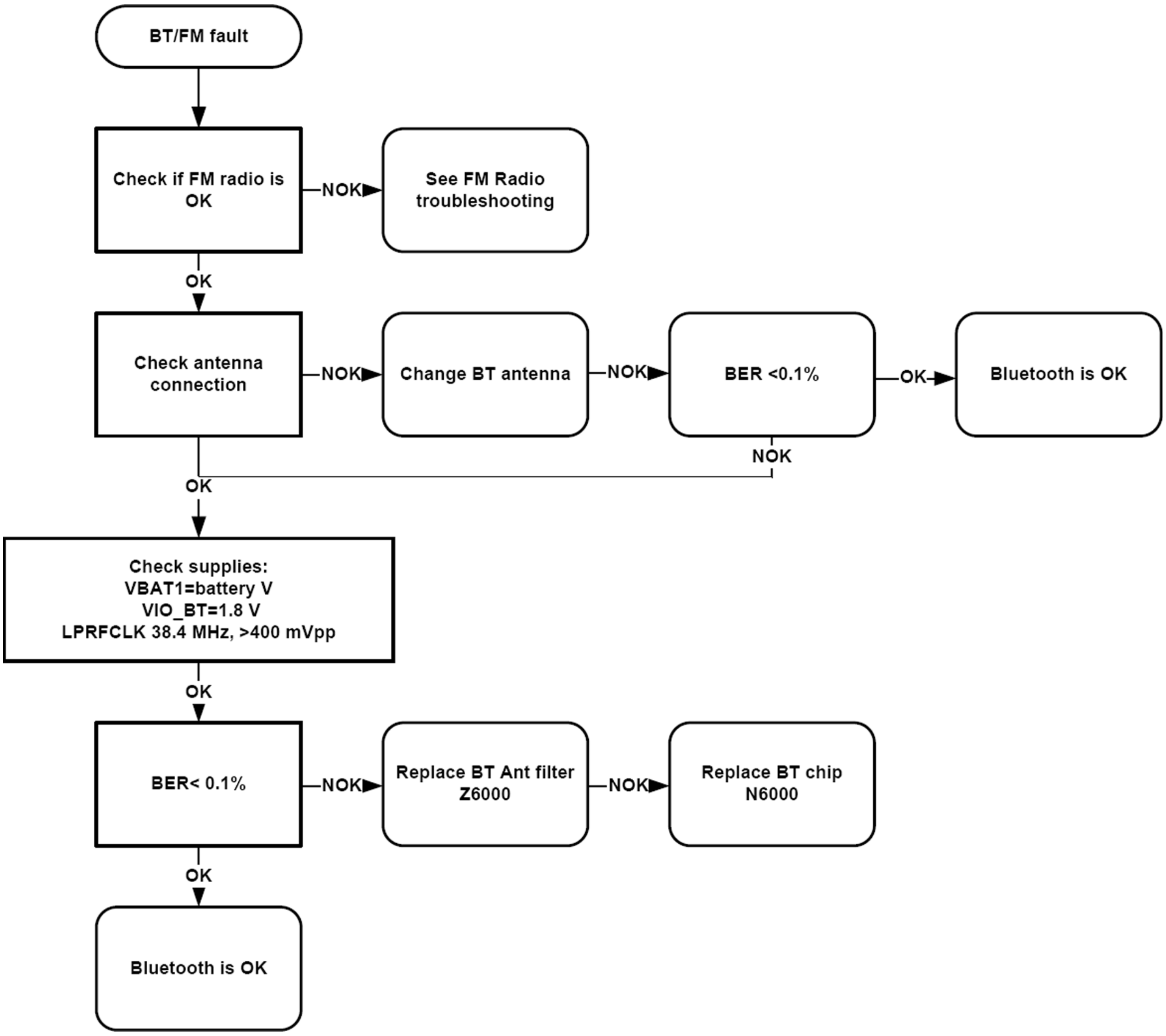


	Test Name	Startup Test	Result	Detailed
☐	keypad	Yes	Not executed [3]	
☐	bbt	No	Not executed [3]	
☑	bluetooth	Yes	Passed [0]	
☐	omap_lcd_test	Yes	Not executed [3]	
☐	lcd	Yes	Not executed [3]	
☐	touchscreen	Yes	Not executed [3]	
☐	audio	Yes	Not executed [3]	
☐	wlan	Yes	Not executed [3]	
☐	gps	Yes	Not executed [3]	
☐	headph_mic	Yes	Not executed [3]	
☐	battery_temp	Yes	Not executed [3]	
☐	headph_jack	Yes	Not executed [3]	

Figure 21 Bluetooth self tests in *Phoenix*

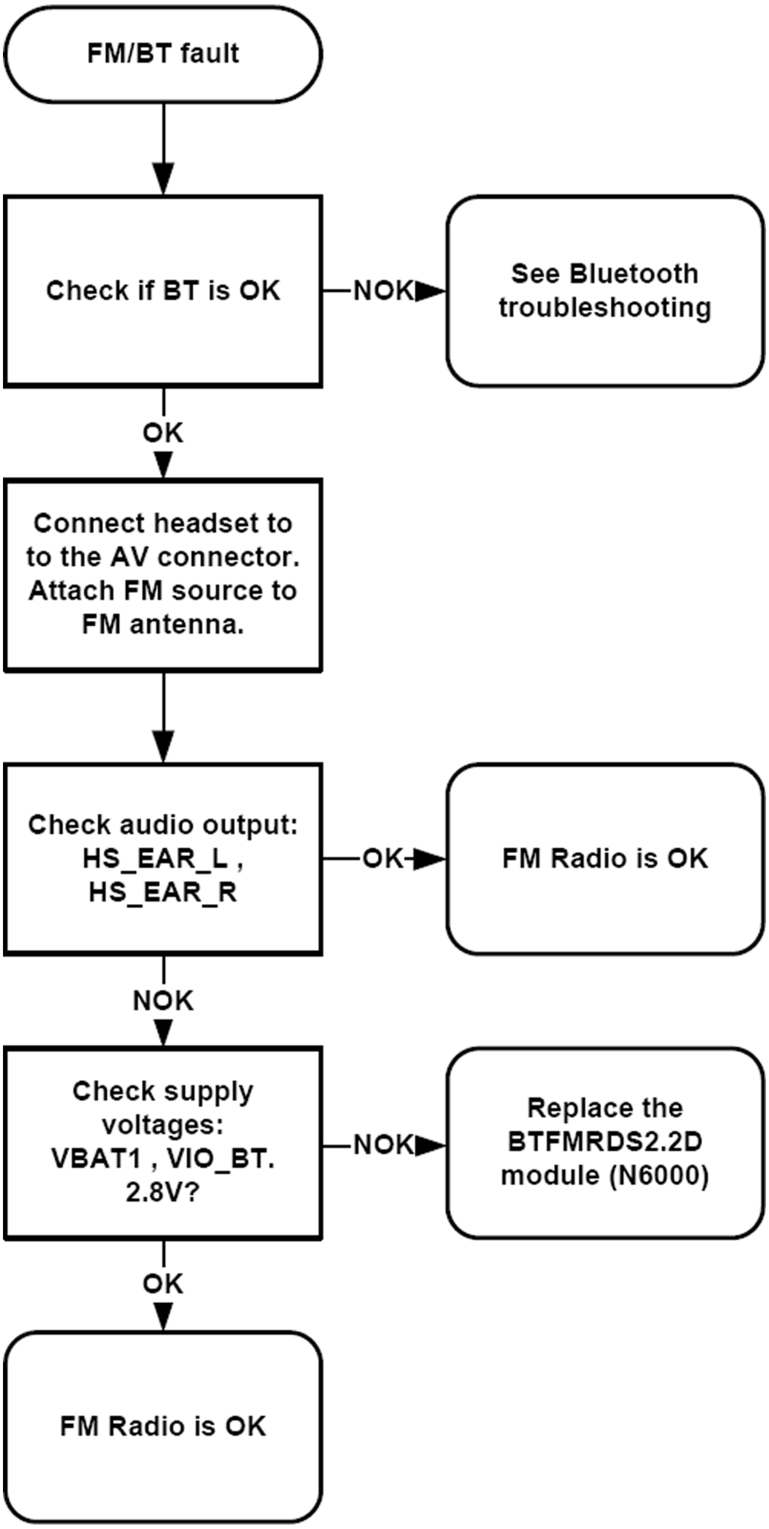
Bluetooth troubleshooting

Troubleshooting flow


BT/FM fault
Check if FM radio is OK
NOK
See FM Radio troubleshooting
OK
Check antenna connection
NOK
Change BT antenna
NOK
BER <0.1%
OK
Bluetooth is OK
NOK
OK
Check supplies:
VBAT1=battery V
VIO_BT=1.8 V
LPRFCLK 38.4 MHz, >400 mVpp
OK
BER< 0.1%
NOK
Replace BT Ant filter Z6000
NOK
Replace BT chip N6000
OK
Bluetooth is OK

FM radio troubleshooting

Troubleshooting flow


FM/BT fault
Check if BT is OK
NOK
See Bluetooth troubleshooting
OK
Connect headset to to the AV connector. Attach FM source to FM antenna.
Check audio output: HS_EAR_L , HS_EAR_R
OK
FM Radio is OK
NOK
Check supply voltages: VBAT1 , VIO_BT. 2.8V?
NOK
Replace the BTFMRDS2.2D module (N6000)
OK
FM Radio is OK

Baseband manual tuning guide

Certificate restoring

Context

This procedure is performed when the device certificate is corrupted for some reason.

All tunings (RF & Baseband, UI) must be done after performing the certificate restoring procedure.

The procedure for certificate restoring is the following:

- Flash the phone with the latest available software using FPS-10 or FPS-21.

  Note: USB flashing does not work for a dead BB5 phone.
- Execute the certificate restore process in Phoenix.
- Tune the phone completely.

  Note: SX-4 smart card is needed.
- If the phone resets after certificate restoring, reflash the phone again.

Required equipment and setup:

- *Phoenix* service software v 2008.38. or newer.
- The latest phone model specific *Phoenix* data package.
- PKD-1 dongle
- SX-4 smart card (Enables testing and tuning features)
- Activated FPS-10 flash prommer **OR** FPS-21 flash prommer
- Latest flash update package for FPS-10 or FPS-21 flash prommers
- CU-4 control unit
- USB cable from PC USB Port to CU-4 control unit
- Phone model specific adapter for CU-4 control unit
- PCS-1 cable to power CU-4 from external power supply
- XCS-4 modular cable between flash prommer and CU-4

  Note: CU-4 must be supplied with +12 V from an external power supply in all steps of certificate restoring.

Steps

1. Program the phone software.
2. Execute the certificate restore process in Phoenix.

Next actions

After a successful rewrite, you must retune the phone completely by using *Phoenix* tuning functions.

Important: Perform all tunings: RF, BB, and UI.

Energy management calibration

Prerequisites

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.
- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose **File→ Scan Product.**
4. Choose **Tuning→Energy Management Calibration.**
5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.
6. Check that the **CU-4 used** check box is checked.
7. Select the item(s) to be calibrated.

   Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.
8. Click **Calibrate**.

   The calibration of the selected item(s) is carried out automatically.

   The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click **Write** to store the new calibration values to the phone permanent memory.

Table 10 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-20	20
ADC Gain	12000	14000
BSI Gain	1100	1300
VBAT Offset	2400	2650
VBAT Gain	19000	23000
VCHAR Gain	N/A	N/A
IBAT (ICal) Gain	7750	12250

9. Click **Read**, and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click **Write** and/or repeat the procedure again.
10. To end the procedure, close the *Energy Management Calibration* window.

4 — RF Troubleshooting

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RF key components

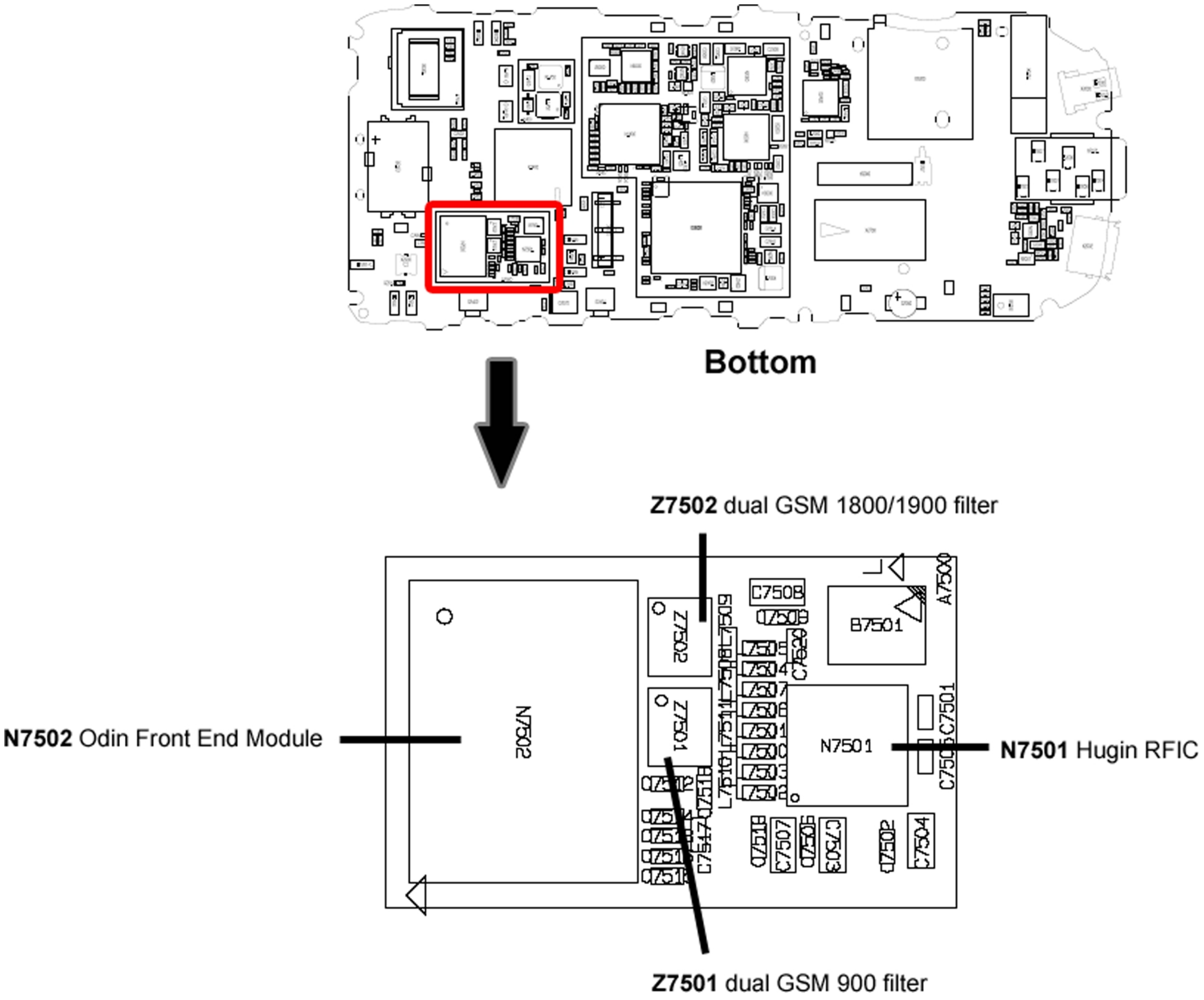

Bottom
Z7502 dual GSM 1800/1900 filter
N7502 Odin Front End Module
N7501 Hugin RFIC
Z7501 dual GSM 900 filter
N7502
N7501
Z7502
Z7501
B7501
A7500

Figure 22 RF key components - bottom

RF Self Tests

Running RF self tests with Phoenix

Prerequisites

Caution: The RF connector should be terminated to 50 Ohms or connected to the antenna. Check this carefully before performing the self tests, otherwise the PA may be damaged.

The order in which the self tests must be executed is specified below:

1 **ST_CDSP_RF_BB_IF_TEST**

Note: If this self test fails, all other self tests will fail even if the functionality might be OK.**Run this self test before running all others.**

2 **ST_CDSP_RF_SUPPLY_TEST**

Note: If this self test fails, it might also affect all the following self tests.

3 **ST_CDSP_PLL_PHASE_LOCK_TEST**

Note: If this self test fails, it affects the **RX_IQ_LOOP_BACK** self test.

4 **ST_CDSP_RX_IQ_LOOP_BACK_TEST**

5 **ST_CDSP_PWR_DETECTOR_BIAS_TEST**

> **Note:** If this self test fails, the **GSM_TX_POWER** self test will also fail.

6 **ST_CDSP_GSM_TX_POWER_TEST**

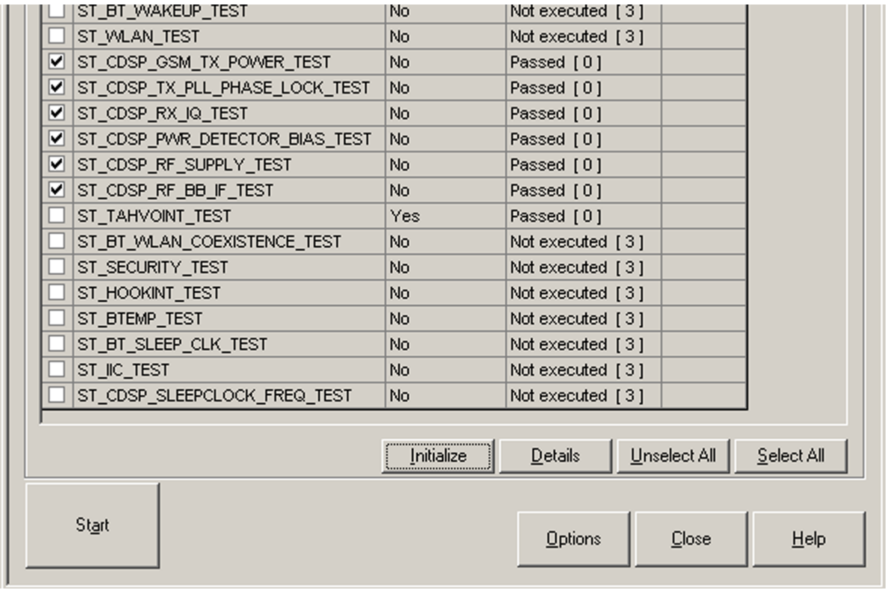
The instructions for running the tests are given below.

Steps

1. Select in Phoenix **Testing→Self Tests** in Phoenix.

   Check the tests shown in the figure below.

   > **Note:** Keep in mind the order in which the self tests should be executed.



☐	ST_BT_WAKEUP_TEST	No	Not executed [3]
☐	ST_WLAN_TEST	No	Not executed [3]
☑	ST_CDSP_GSM_TX_POWER_TEST	No	Passed [0]
☑	ST_CDSP_TX_PLL_PHASE_LOCK_TEST	No	Passed [0]
☑	ST_CDSP_RX_IQ_TEST	No	Passed [0]
☑	ST_CDSP_PWR_DETECTOR_BIAS_TEST	No	Passed [0]
☑	ST_CDSP_RF_SUPPLY_TEST	No	Passed [0]
☑	ST_CDSP_RF_BB_IF_TEST	No	Passed [0]
☐	ST_TAHVOINT_TEST	Yes	Passed [0]
☐	ST_BT_WLAN_COEXISTENCE_TEST	No	Not executed [3]
☐	ST_SECURITY_TEST	No	Not executed [3]
☐	ST_HOOKINT_TEST	No	Not executed [3]
☐	ST_BTEMP_TEST	No	Not executed [3]
☐	ST_BT_SLEEP_CLK_TEST	No	Not executed [3]
☐	ST_IIC_TEST	No	Not executed [3]
☐	ST_CDSP_SLEEPCLOCK_FREQ_TEST	No	Not executed [3]

2. Click **Details** to see the error codes.

Next actions

If a self test result is fatal, check the error codes from RF self test error codes (page 4–6), and follow the instructions given in RF self test troubleshooting overview (page 4–8).

RF self test error codes

If the result of the **ST_CDSP_RF_BB_IF_TEST** is fatal, the result of all the other self tests will also be fatal. Always start troubleshooting with the **ST_CDSP_RF_BB_IF_TEST**.

ST_CDSP_RF_BB_IF_TEST result is fatal

Error code	Error code	Comment
ST_RFBUS_WRITE_READ_FAIL	(0x0040)	RF bus write/read test failed.

ST_CDSP_RF_SUPPLY_TEST result is fatal

Error code	Error code	Comment
ST_VBAT_OUT_OF_RANGE	(0x0001)	VBat voltage is not within range.

ST_CDSP_PLL_PHASE_LOCK_TEST result is fatal

Error code	Error code	Comment
ST_TX_PLL_FAIL	(0x0008)	Tx PLL test failed.

ST_CDSP_RX_IQ_LOOP_BACK_TEST result is fatal

Error code	Error code	Comment
ST_RX_IQ_TEST_FAILED	(0x0001)	Break in Rx signal chain.

ST_CDSP_PW_DETECTOR_BIAS_TEST result is fatal

Error code	Error code	Comment
ST_PWR_VALUE_OUTSIDE_LIMITS	(0x0004)	Power detector values outside the range.

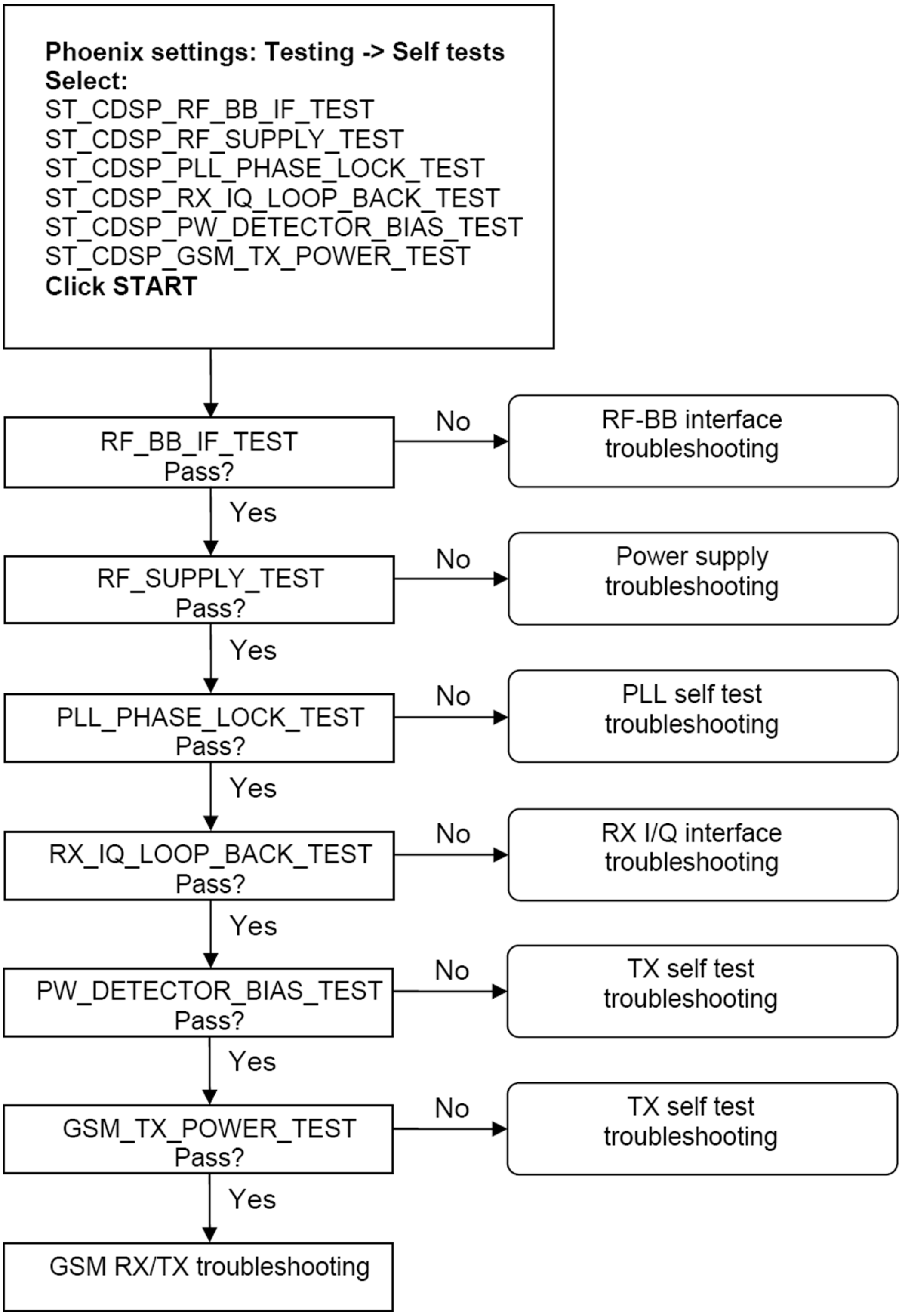
ST_CDSP_GSM_TX_POWER_TEST result is fatal

Error code	Error code	Comment
ST_GSM900_TX_PWR_LOW	(0x0001)	GSM900 Tx power is under threshold.
ST_GSM1800_TX_PWR_LOW	(0x0002)	GSM1800 Tx power is under threshold.
ST_GSM1900_TX_PWR_LOW	(0x0004)	GSM1900 Tx power is under threshold.
ST_GSM900_ADC_OVERFLOW	(0x0010)	GSM900 ADC overflow.
ST_GSM1800_ADC_OVERFLOW	(0x0020)	GSM1800 ADC overflow.
ST_GSM1900_ADC_OVERFLOW	(0x0040)	GSM1900 ADC overflow.

Troubleshooting with RF Self Tests

RF self test troubleshooting overview

Troubleshooting flow


Phoenix settings: Testing -> Self tests
Select:
ST_CDSP_RF_BB_IF_TEST
ST_CDSP_RF_SUPPLY_TEST
ST_CDSP_PLL_PHASE_LOCK_TEST
ST_CDSP_RX_IQ_LOOP_BACK_TEST
ST_CDSP_PW_DETECTOR_BIAS_TEST
ST_CDSP_GSM_TX_POWER_TEST
Click START
RF_BB_IF_TEST Pass?
No
RF-BB interface troubleshooting
Yes
RF_SUPPLY_TEST Pass?
No
Power supply troubleshooting
Yes
PLL_PHASE_LOCK_TEST Pass?
No
PLL self test troubleshooting
Yes
RX_IQ_LOOP_BACK_TEST Pass?
No
RX I/Q interface troubleshooting
Yes
PW_DETECTOR_BIAS_TEST Pass?
No
TX self test troubleshooting
Yes
GSM_TX_POWER_TEST Pass?
No
TX self test troubleshooting
Yes
GSM RX/TX troubleshooting

RF-BB interface troubleshooting (ST_CDSP_RF_BB_IF_TEST)

Troubleshooting flow

Phoenix settings: Testing -> GSM -> RF Controls
Active Unit = RX
Band = 900 band
Op Mode = Burst
AGC = default

Scope at
RFBusClk (J2804)
Signal = 2.7 V
DC offset = -0.47 V
Freq = 9.6 MHz
RFBusDa (J2805)
Signal = 2.05 V
DC offset = -0.09 V
RFBusEN1x (J2806)
Signal = 2.05 V
DC offset = -0.09 V

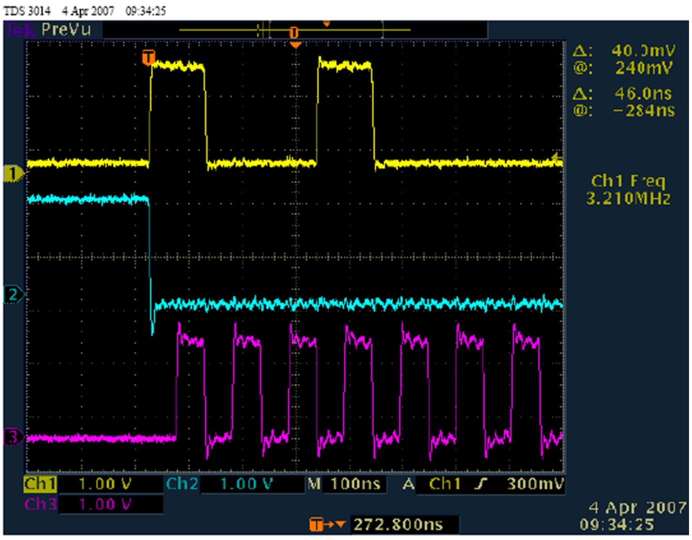
OK?

No

Baseband troubleshooting

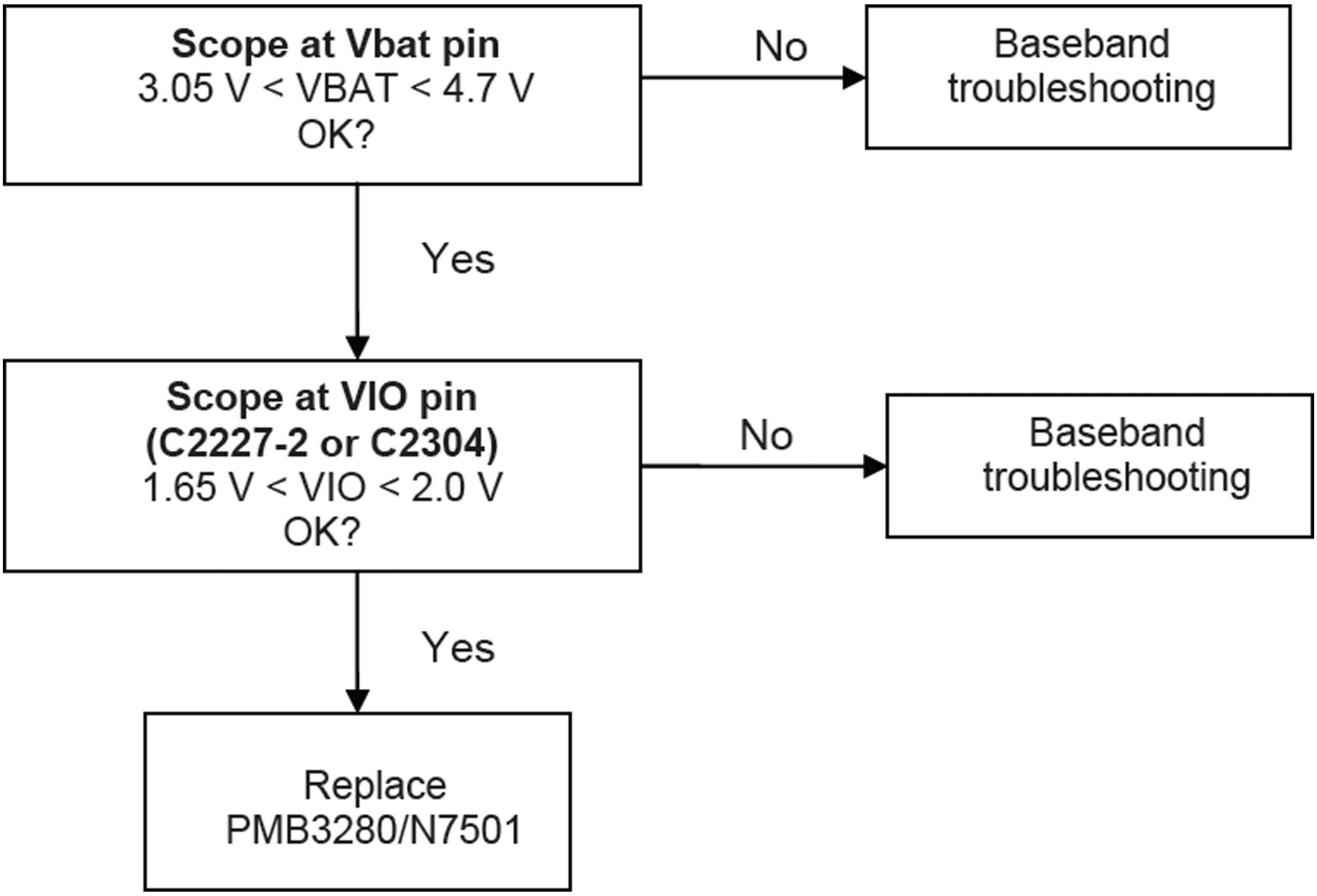
Yes

RF-BB Interface failure.
Replace PMB3280


TDS 3014 4 Apr 2007 09:34:25
Tek PreVu
Δ: 40.0mV
@: 240mV
Δ: 46.0ns
@: -284ns
Ch1 Freq
3.210MHz
1
2
3
Ch1 1.00 V
Ch2 1.00 V
M 100ns
A Ch1 ∫ 300mV
Ch3 1.00 V
272.800ns
4 Apr 2007
09:34:25

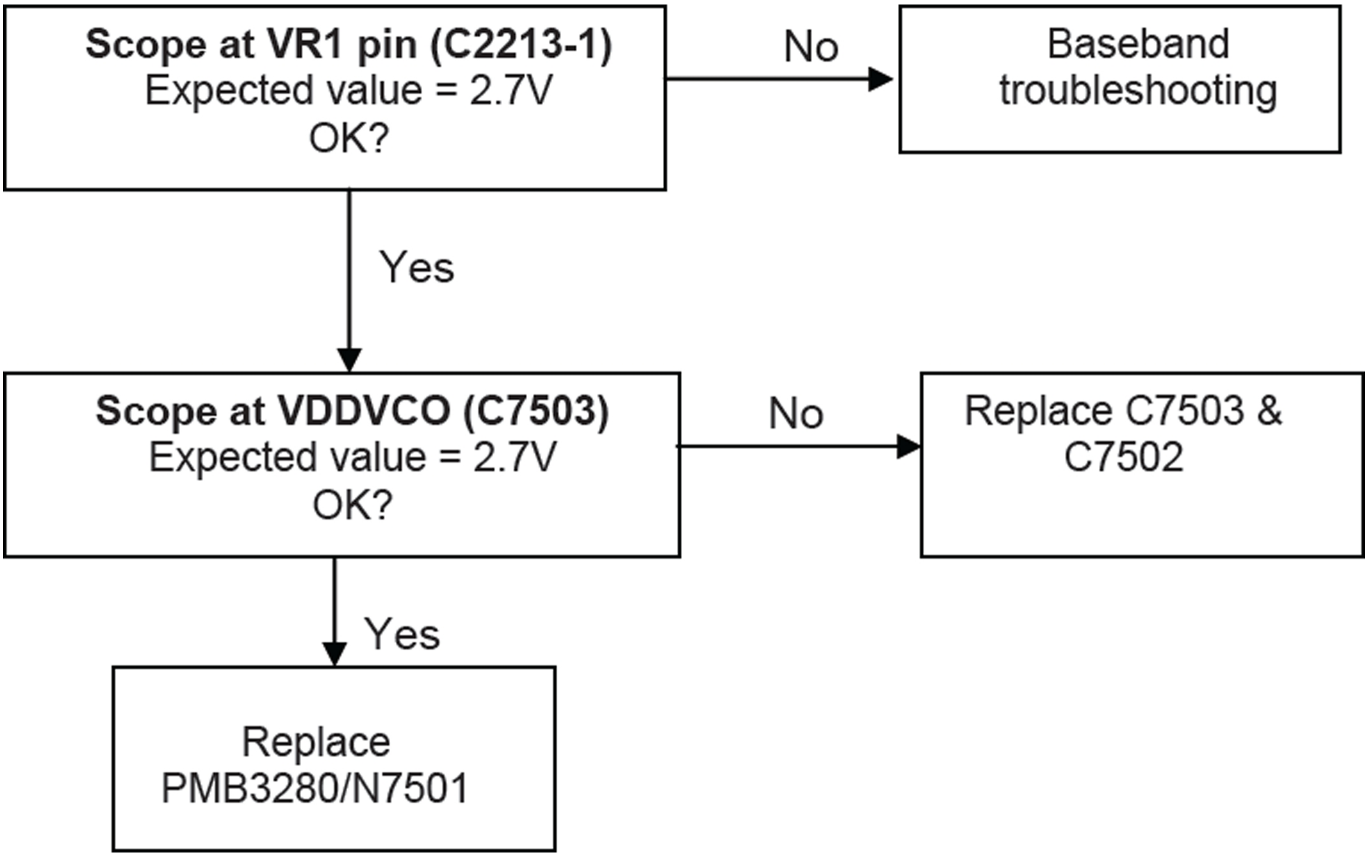
Power supply troubleshooting (ST_CDSP_RF_SUPPLY_TEST)

Troubleshooting flow


Scope at Vbat pin
3.05 V < VBAT < 4.7 V
OK?
No
Baseband troubleshooting
Yes
Scope at VIO pin
(C2227-2 or C2304)
1.65 V < VIO < 2.0 V
OK?
No
Baseband troubleshooting
Yes
Replace PMB3280/N7501

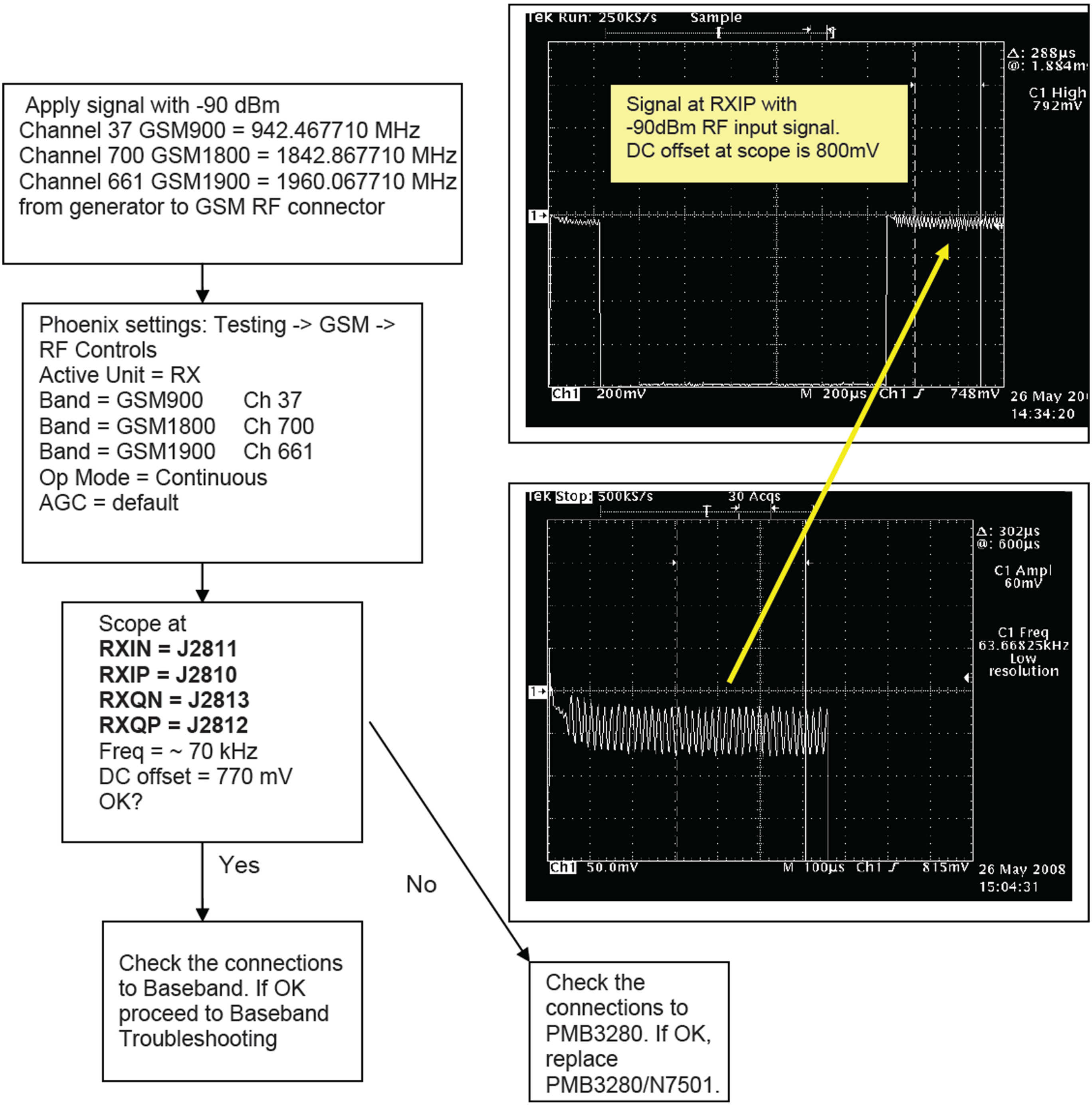
PLL self test troubleshooting (ST_CDSP_PLL_PHASE_LOCK_TEST)

Troubleshooting flow


Scope at VR1 pin (C2213-1)
Expected value = 2.7V
OK?
No
Baseband troubleshooting
Yes
Scope at VDDVCO (C7503)
Expected value = 2.7V
OK?
No
Replace C7503 & C7502
Yes
Replace PMB3280/N7501

RX IQ interface troubleshooting (ST_CDSP_RX_IQ_LOOP_BACK_TEST)

Troubleshooting flow



Apply signal with -90 dBm
Channel 37 GSM900 = 942.467710 MHz
Channel 700 GSM1800 = 1842.867710 MHz
Channel 661 GSM1900 = 1960.067710 MHz
from generator to GSM RF connector

Phoenix settings: Testing -> GSM -> RF Controls
Active Unit = RX
Band = GSM900 Ch 37
Band = GSM1800 Ch 700
Band = GSM1900 Ch 661
Op Mode = Continuous
AGC = default

Scope at
RXIN = J2811
RXIP = J2810
RXQN = J2813
RXQP = J2812
Freq = ~ 70 kHz
DC offset = 770 mV
OK?

Yes

Check the connections to Baseband. If OK proceed to Baseband Troubleshooting

No

Check the connections to PMB3280. If OK, replace PMB3280/N7501.

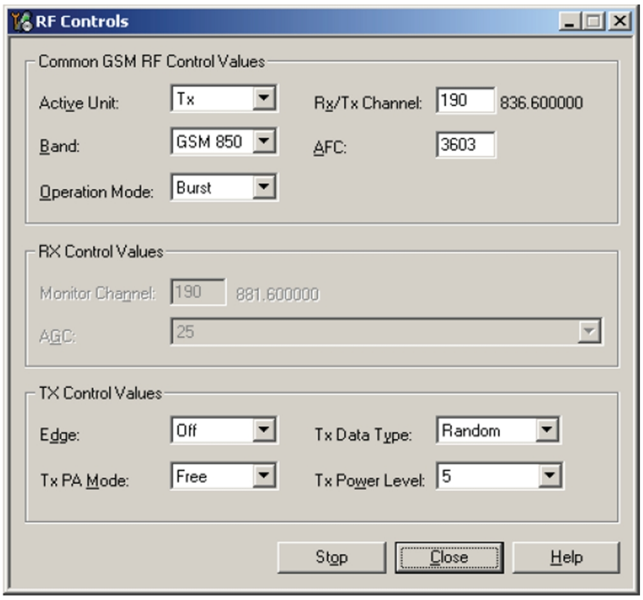
Signal at RXIP with -90dBm RF input signal. DC offset at scope is 800mV

Tek Run: 250kS/s Sample
Δ: 288µs
@: 1.884m
C1 High
792mV
1→
Ch1 200mV
M 200µs Ch1 ∫ 748mV
26 May 20
14:34:20
Tek Stop: 500kS/s 30 Acqs
Δ: 302µs
@: 600µs
C1 Ampl
60mV
C1 Freq
63.66825kHz
Low resolution
1→
Ch1 50.0mV
M 100µs Ch1 ∫ 815mV
26 May 2008
15:04:31

TX selftest troubleshooting (ST_CDSP_PWR_DETECTOR_BIAS_TEST and ST_CDSP_GSM_TX_POWER_TEST)

Troubleshooting flow

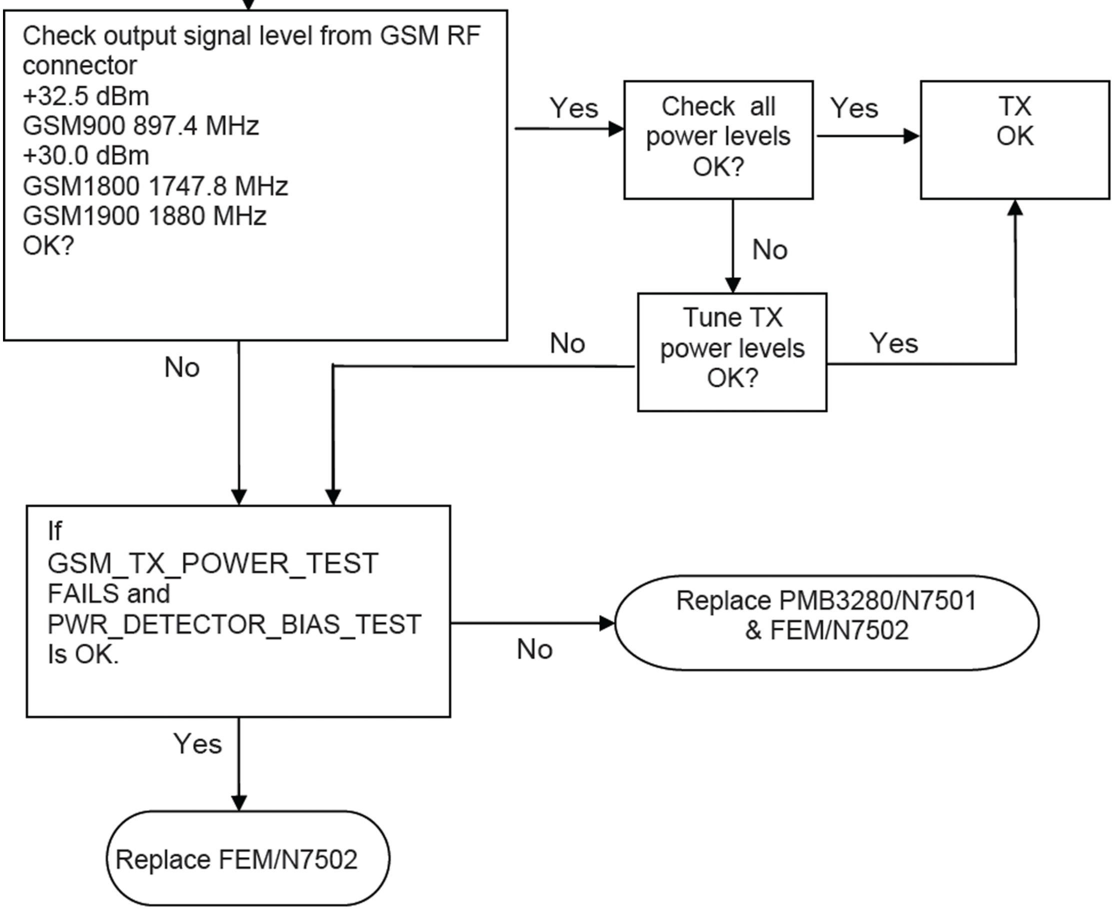
Phoenix settings: Testing -> GSM -> RF Controls
Active Unit = TX
Band = GSM900
Band = GSM1800
Band = GSM1900
Op Mode = Burst
AGC = default
TX Channel = 37 GSM900
TX Channel = 700 GSM1800
TX Channel = 661 GSM1900
EDGE = Off
TX Data type = Random
Power level = 5 GSM900
Power level = 0 GSM1800/1900


RF Controls
Stop
Close
Help

Common GSM RF Control Values
Active Unit: Tx
Band: GSM 850
Operation Mode: Burst
Rx/Tx Channel: 190 836.600000
AFC: 3603

RX Control Values
Monitor Channel: 190 881.600000
AGC: 25

TX Control Values
Edge: Off
Tx PA Mode: Free
Tx Data Type: Random
Tx Power Level: 5


Check output signal level from GSM RF connector
+32.5 dBm
GSM900 897.4 MHz
+30.0 dBm
GSM1800 1747.8 MHz
GSM1900 1880 MHz
OK?
Yes
Check all power levels OK?
Yes
TX OK
No
Tune TX power levels OK?
Yes
No
No
If GSM_TX_POWER_TEST FAILS and PWR_DETECTOR_BIAS_TEST Is OK.
No
Replace PMB3280/N7501 & FEM/N7502
Yes
Replace FEM/N7502

Receiver Troubleshooting

Introduction to RX troubleshooting

RX can be tested by making a phone call or in local mode. For the local mode testing, use Phoenix service software.

The main RX troubleshooting measurement is RSSI reading. This test measures the signal strength of the received signal. For GSM RSSI measurements, see GSM RX chain activation for manual measurements / GSM RSSI measurement (page 4–14).

GSM RX chain activation for manual measurements/GSM RSSI measurement

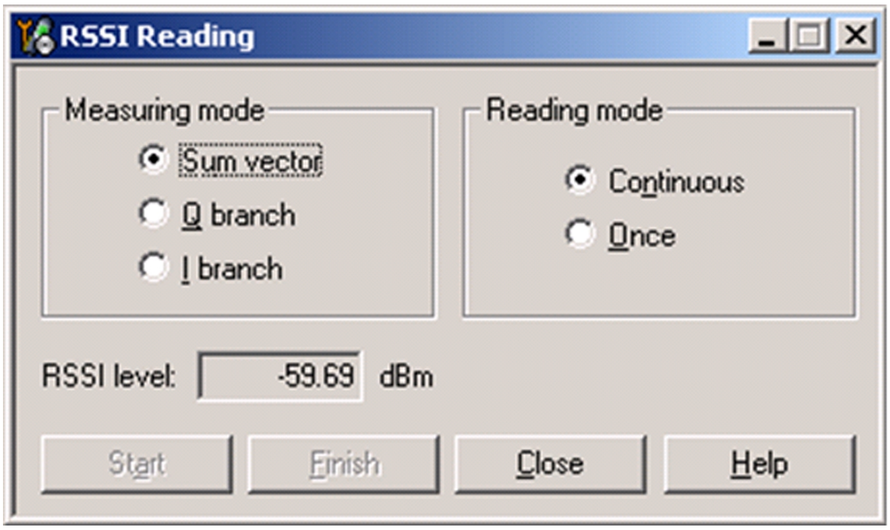
Prerequisites

Make the following settings in Phoenix service software:

Setting	GSM900	GSM1800	GSM1900
Phoenix Channel	37	700	661
Signal generator to antenna connector	942.46771MHz (67.71kHz offset) at -60dBm	1842.86771MHz (67.71kHz offset) at -60dBm	1960.06771MHz (67.71kHz offset) at -60dBm

Steps

1. Set the phone to local mode.
2. Activate RSSI reading in Phoenix (**Testing→GSM→RSSI reading**)



RSSI Reading

Measuring mode
● Sum vector
○ Q branch
○ I branch

Reading mode
● Continuous
○ Once

RSSI level: -59.69 dBm

Results

The reading should reflect the level of the signal generator (-losses) +/- 1dB.

When varying the level in the range -30 to -102 dBm, the reading should then follow within +/-2 dB.

Transmitter Troubleshooting

General instructions for TX troubleshooting

Please note the following before performing transmitter tests:

- TX troubleshooting requires TX operation.
- Do not transmit on frequencies that are in use!
- The transmitter can be controlled in local mode for diagnostic purposes.
- The most useful Phoenix tool for GSM transmitter testing is “RF Controls”.
- Remember that re-tuning is not a fix! Phones are tuned correctly in production.

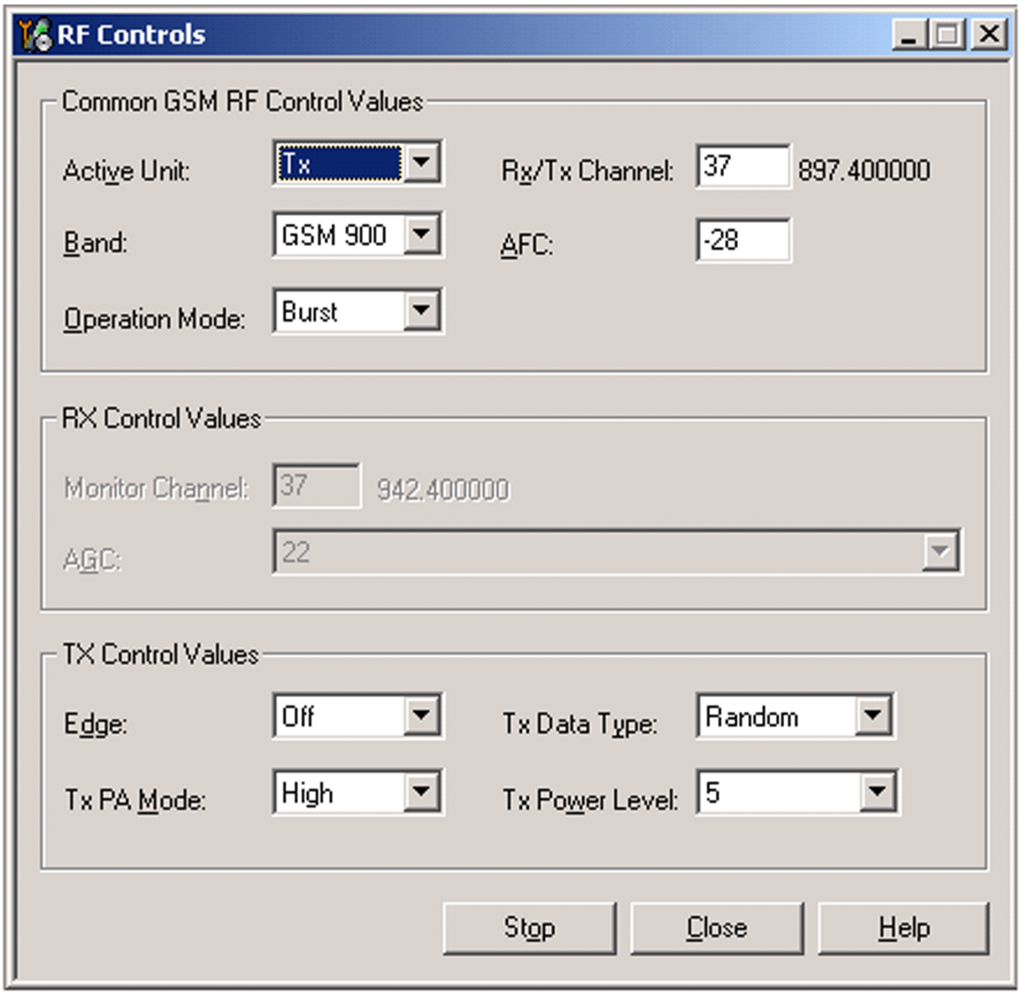
Note: Never activate the GSM transmitter without a proper antenna load. Always connect a 50 Ohm load to the RF connector (antenna, RF measurement equipment or at least a 2 Watt dummy load); otherwise the GSM PA may be damaged.

GSM transmitter troubleshooting

Steps

1. Set the phone to local mode.
2. Activate RF controls in Phoenix (**Testing→GSM→Rf Controls**).

   Use the following settings:



RF Controls

Common GSM RF Control Values

Active Unit: Tx

Rx/Tx Channel: 37 897.400000

Band: GSM 900

AFC: -28

Operation Mode: Burst

RX Control Values

Monitor Channel: 37 942.400000

AGC: 22

TX Control Values

Edge: Off

Tx Data Type: Random

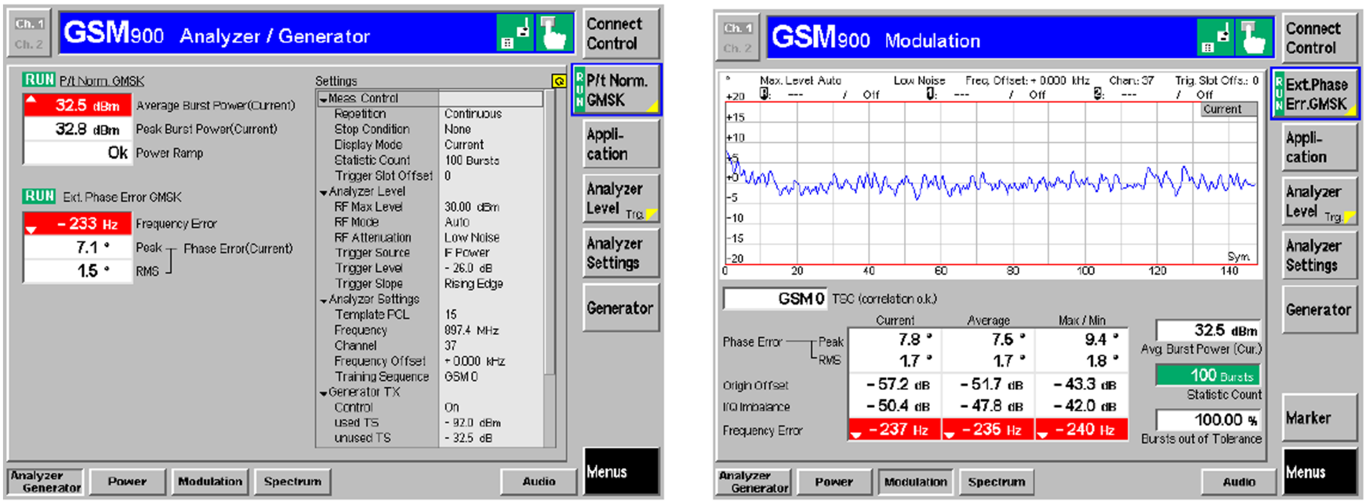
Tx PA Mode: High

Tx Power Level: 5

3. Use a communication analyser (for example CMU200) to check the basic TX parameters (i.e. power, phase error, modulation and switching spectrum).

Analyzer settings:

Phase error:


Ch. 1
Ch. 2
GSM900 Analyzer / Generator
Connect Control
P/t Norm. GMSK
Appli-cation
Analyzer Level Trg.
Analyzer Settings
Generator
Menus
Analyzer Generator
Power
Modulation
Spectrum
Audio
GSM900 Modulation
Ext.Phase Err.GMSK
Marker
Max. Level: Auto
Low Noise
Freq. Offset: + 0.000 kHz
Chan.: 37
Trig. Slot Offs.: 0
Off
Current
+20
+15
+10
+5
-5
-10
-15
-20
Sym.
0
20
40
60
80
100
120
140

RUN P/t Norm. GMSK

32.5 dBm	Average Burst Power(Current)
32.8 dBm	Peak Burst Power(Current)
Ok	Power Ramp

RUN Ext. Phase Error GMSK

– 233 Hz	Frequency Error
7.1 °	Peak – Phase Error(Current)
1.5 °	RMS

Settings

Meas. Control	
Repetition	Continuous
Stop Condition	None
Display Mode	Current
Statistic Count	100 Bursts
Trigger Slot Offset	0
Analyzer Level	
RF Max Level	30.00 dBm
RF Mode	Auto
RF Attenuation	Low Noise
Trigger Source	IF Power
Trigger Level	- 26.0 dB
Trigger Slope	Rising Edge
Analyzer Settings	
Template PCL	15
Frequency	897.4 MHz
Channel	37
Frequency Offset	+ 0.000 kHz
Training Sequence	GSM 0
Generator TX	
Control	On
used TS	- 92.0 dBm
unused TS	- 32.5 dB

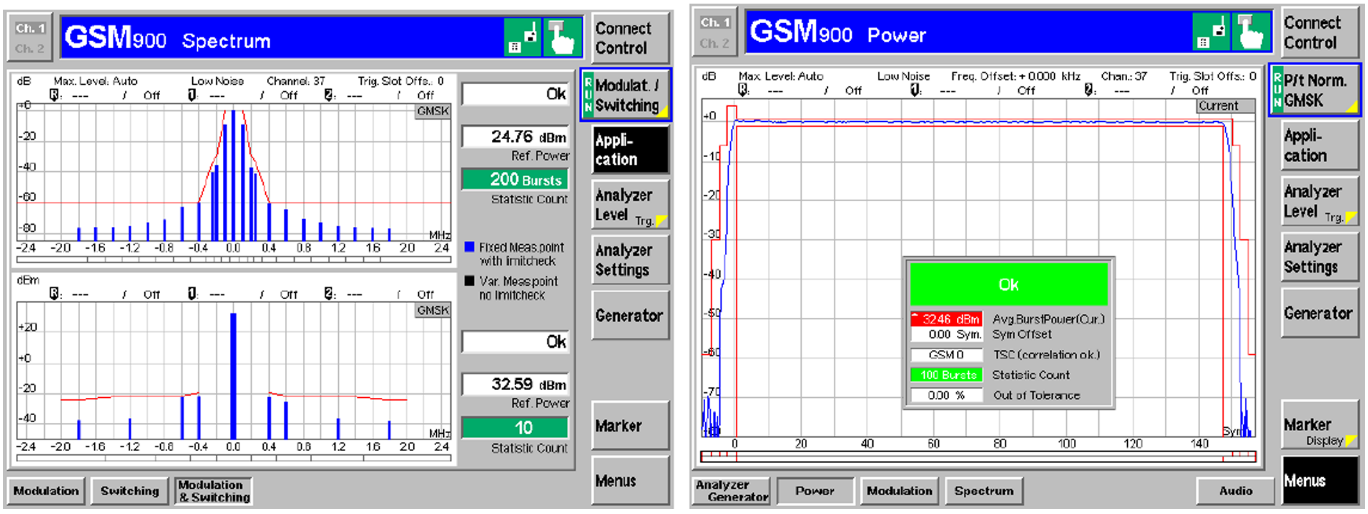
GSM 0 TSC (correlation o.k.)

		Current	Average	Max / Min
Phase Error	Peak	7.8 °	7.5 °	9.4 °
	RMS	1.7 °	1.7 °	1.8 °
Origin Offset		– 57.2 dB	– 51.7 dB	– 43.3 dB
I/Q Imbalance		– 50.4 dB	– 47.8 dB	– 42.0 dB
Frequency Error		– 237 Hz	– 235 Hz	– 240 Hz

32.5 dBm	Avg. Burst Power (Cur.)
100 Bursts	Statistic Count
100.00 %	Bursts out of Tolerance

Modulation-/Switching spectrum:

Power / burst:


Ch. 1
Ch. 2
GSM900 Spectrum
Connect Control
Modulat. / Switching
Appli-cation
Analyzer Level Trg.
Analyzer Settings
Generator
Marker
Menus
Modulation
Switching
Modulation & Switching
dB
Max. Level: Auto
Low Noise
Channel: 37
Trig. Slot Offs.: 0
Off
GMSK
+0
-20
-40
-60
-80
MHz
-2.4
-2.0
-1.6
-1.2
-0.8
-0.4
0.0
0.4
0.8
1.2
1.6
2.0
2.4
dBm
+20
GSM900 Power
P/t Norm. GMSK
Marker Display
Analyzer Generator
Power
Modulation
Spectrum
Audio
Freq. Offset: + 0.000 kHz
Chan.: 37
Current
-10
-30
-50
-70
Sym.
0
20
40
60
80
100
120
140

Ok	
24.76 dBm	Ref. Power
200 Bursts	Statistic Count

■ Fixed Meas.point with limitcheck
■ Var. Meas.point no limitcheck

Ok	
32.59 dBm	Ref. Power
10	Statistic Count

Ok

32.46 dBm	Avg.BurstPower(Cur.)
0.00 Sym.	Sym Offset
GSM 0	TSC (correlation o.k.)
100 Bursts	Statistic Count
0.00 %	Out of Tolerance

Figure 23 Typical readings

4. Change the power level (RF controls) and make sure the power reading follows accordingly.

Next actions

You can troubleshoot the GSM transmitter for each GSM band separately, one band at a time. If you want to troubleshoot GSM1800 or GSM1900, change the band with the RF controls and set the communication analyser accordingly.

Checking antenna functionality

Antenna overview

Both antennas (GSM and Bluetooth) and the IHF are integrated into the same antenna module assembly. C-clips on the main PWB provide the connection to the antenna module.

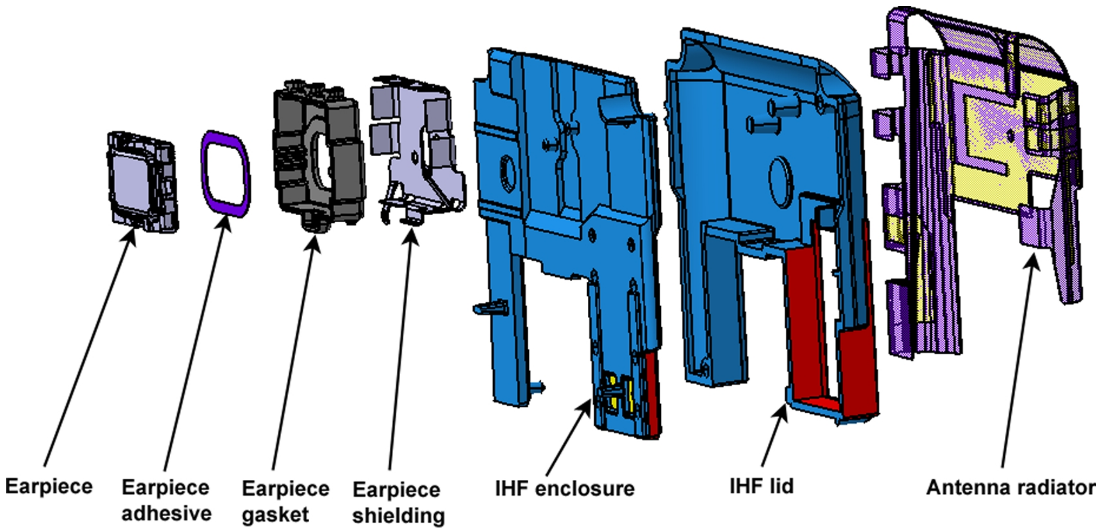

Earpiece
Earpiece adhesive
Earpiece gasket
Earpiece shielding
IHF enclosure
IHF lid
Antenna radiator

Figure 24 Antenna module assembly

The antenna module assembly is attached to the B-cover.

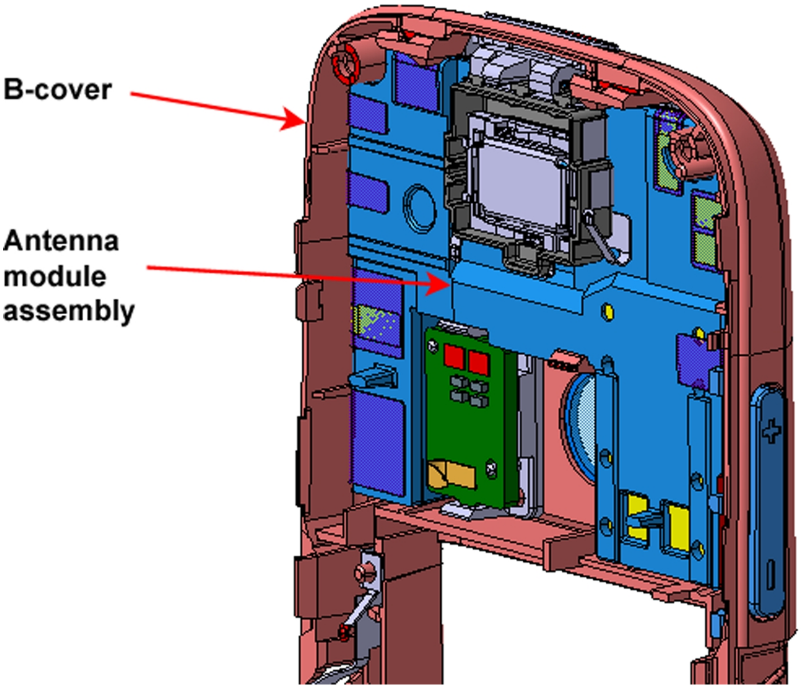

B-cover
Antenna module assembly

Figure 25 Antenna module assembly attached to the B-cover

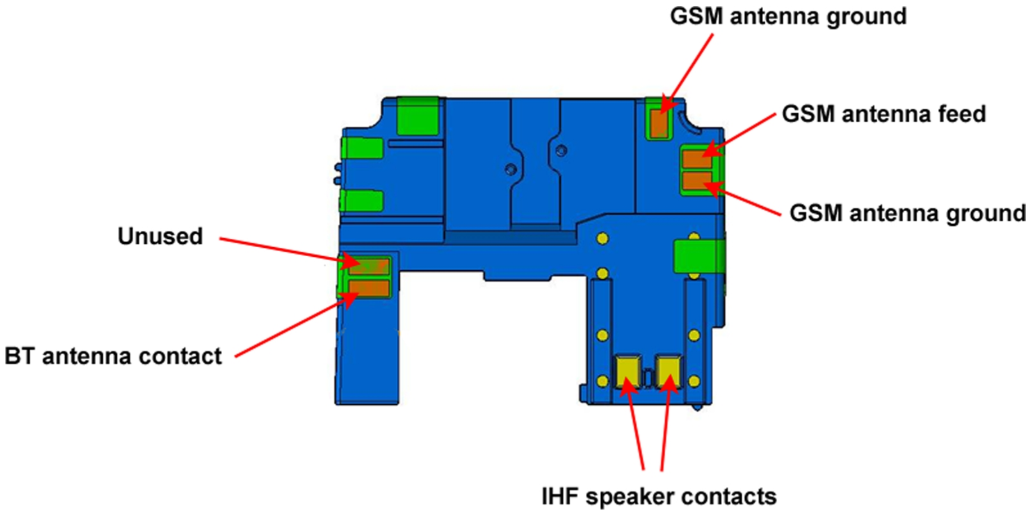


Figure 26 Antenna components and contacts

Main antenna functionality

The main GSM antenna is functioning normally when the antenna module assembly is visually intact in the B-cover and PWB, and the antenna radiator is visually intact in the antenna module assembly.

The main antenna functionality must also be checked by measuring the transmitted power with RF coupler at:

- GSM900 channel 124
- GSM1800 channel 885
- GSM1900 channel 810

BT antenna functionality

The BT antenna is functioning normally when the antenna spring clips take proper contact to PWB.

RF auto-tuning

This phone has to be tuned automatically by using auto-tuning in Phoenix.

Auto-tuning is designed to align the phone's RF part easier and faster. It performs calibrations, tunings and measurements of RX and TX. The results are displayed and logged in a result file.

Hardware setup for auto-tuning

- PC (Windows XP) with GPIB card
- Power supply
- Product specific module jig (MJ-172)
- Cables: RF cable + additional product-specific Murata RF probe (MXHS83QE1000), USB cable, GBIP cable and DAU-9S cable
- Smart Card Reader with Super Dongle: SX-4 (connected to the PC)
- Radio Communication Tester (R&S CMU200 or Willtec) or separate RF signal analyser, RF signal generator and RF splitter.

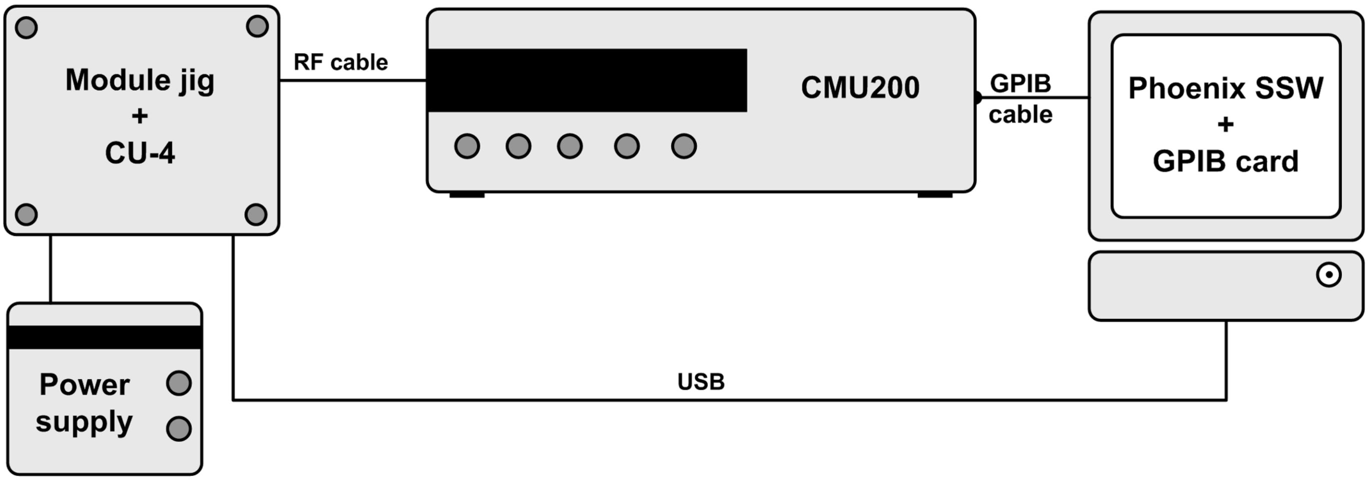

Module jig
+
CU-4
RF cable
CMU200
GPIB
cable
Phoenix SSW
+
GPIB card
Power
supply
USB

Figure 27 Auto-tuning concept with CMU200

Phoenix preparations

Install the phone-specific data package. This defines the phone-specific settings.

Auto-tuning procedure

1 Make sure the phone (in the jig) is connected to the equipment and product detected in Phoenix.

2 Select **Auto-Tune** from the **Tuning** menu.

3 Ensure that the correct cable attenuations are set in SetLoss feature, accessible in the **Tuning** menu with higher CCS dongles (not with PKD-1).

4 Click the *Tune* button to start auto-tuning.

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5 — System Module and User Interface

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Introduction

Phone description

RAP is the main digital baseband ASIC in the phone. It contains functionality for the GSM EDGE. The hardware accelerator is used as a camera accelerator.

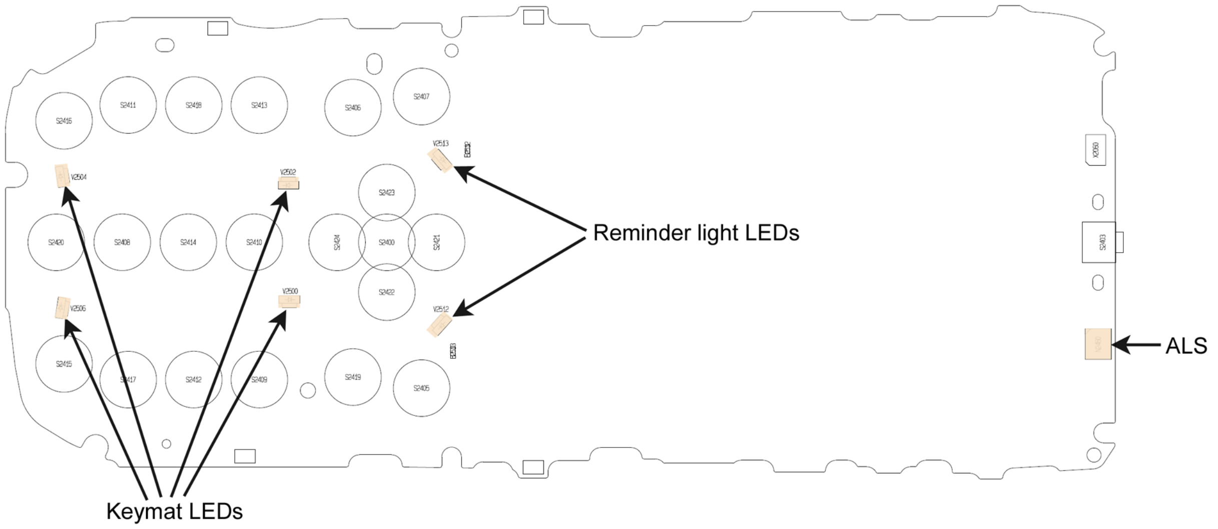
N2200 (AVILMA) is mainly the audio ASIC in the phone and N2300 (BETTY) is basically the energy management controller for the phone.

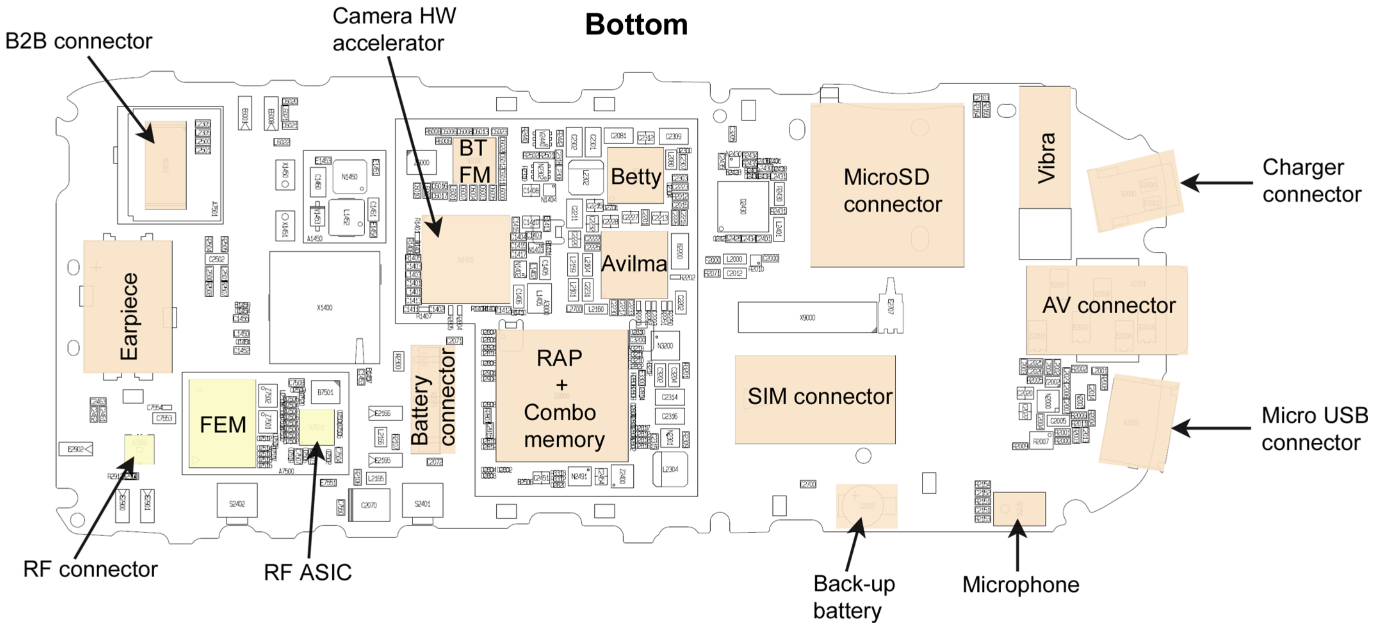
Key components

Function	Description	Item ref
Main board	2YF	
Flash PWB	2AH	
Energy management ASIC	AVILMA BETTY	N2200 N2300
Processor	RAPS (v3.03)	D2800
Camera HW accelerator	DM5012 Julie Stacked	N1400
RF ASIC	RF IC	N7501
PA GSM	Front end module (FEM), quad band	N7502
RF connector		X2900
Memory	512 Mbit NOR + 256 Mbit DRAM Combo (Stacked with RAP)	D3000
Bluetooth	BTHFMRDS2.2D	N6000
FM radio	BTHFMRDS2.2D	N6000
Battery	BL-5CT 1050 mAh	
Battery connector	Tabby interface	X2070
Back-up battery		G2200
B2B connector		X6301
Micro USB connector	For data and audio	X2002
MicroSD connector		X3200
SIM connector		X2700
Charging connector		X2000
AV connector (3.5mm)		X2101
Earpiece		B2103
Microphone		B2150
Vibra		M2101

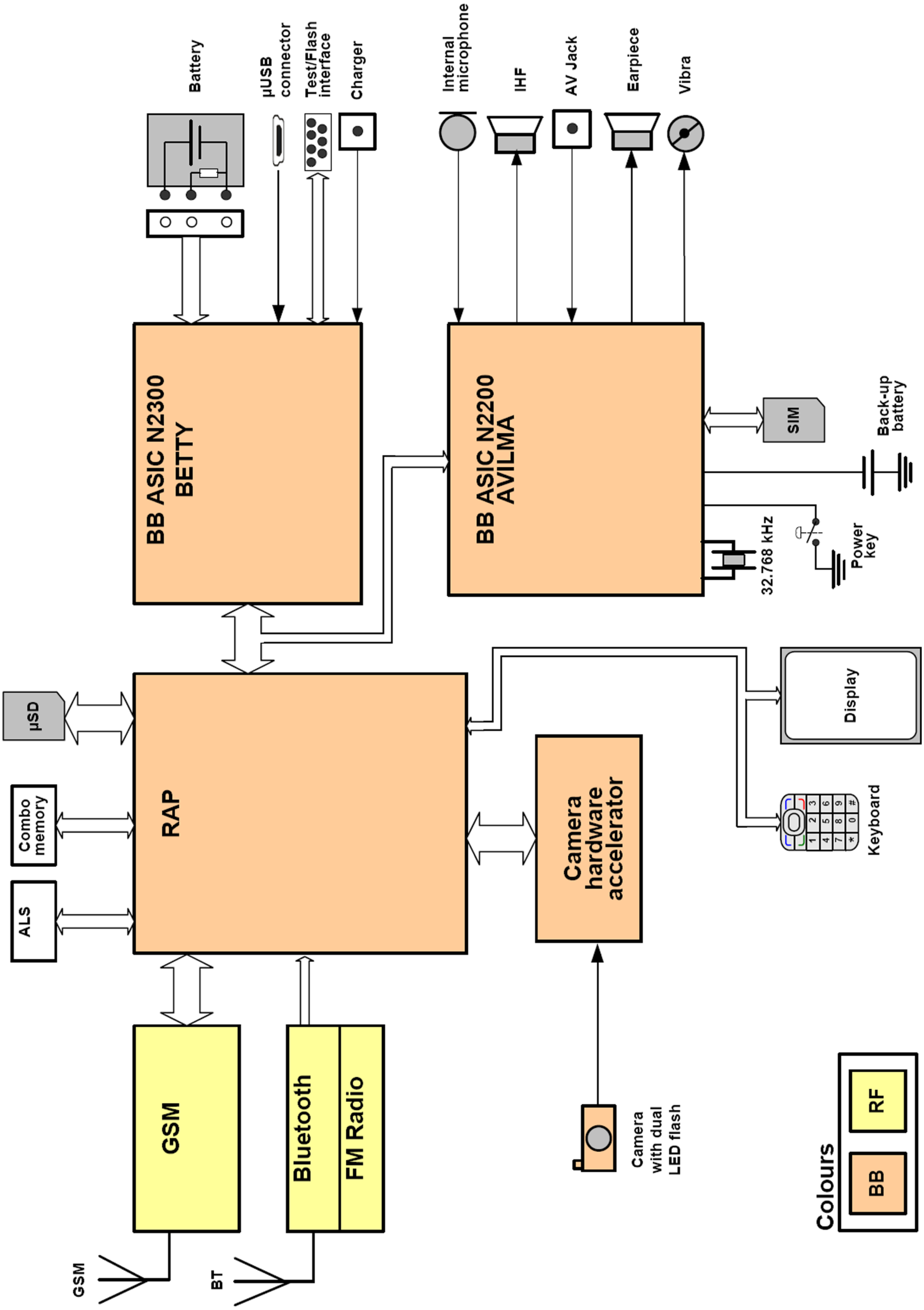
Key component placement

Top

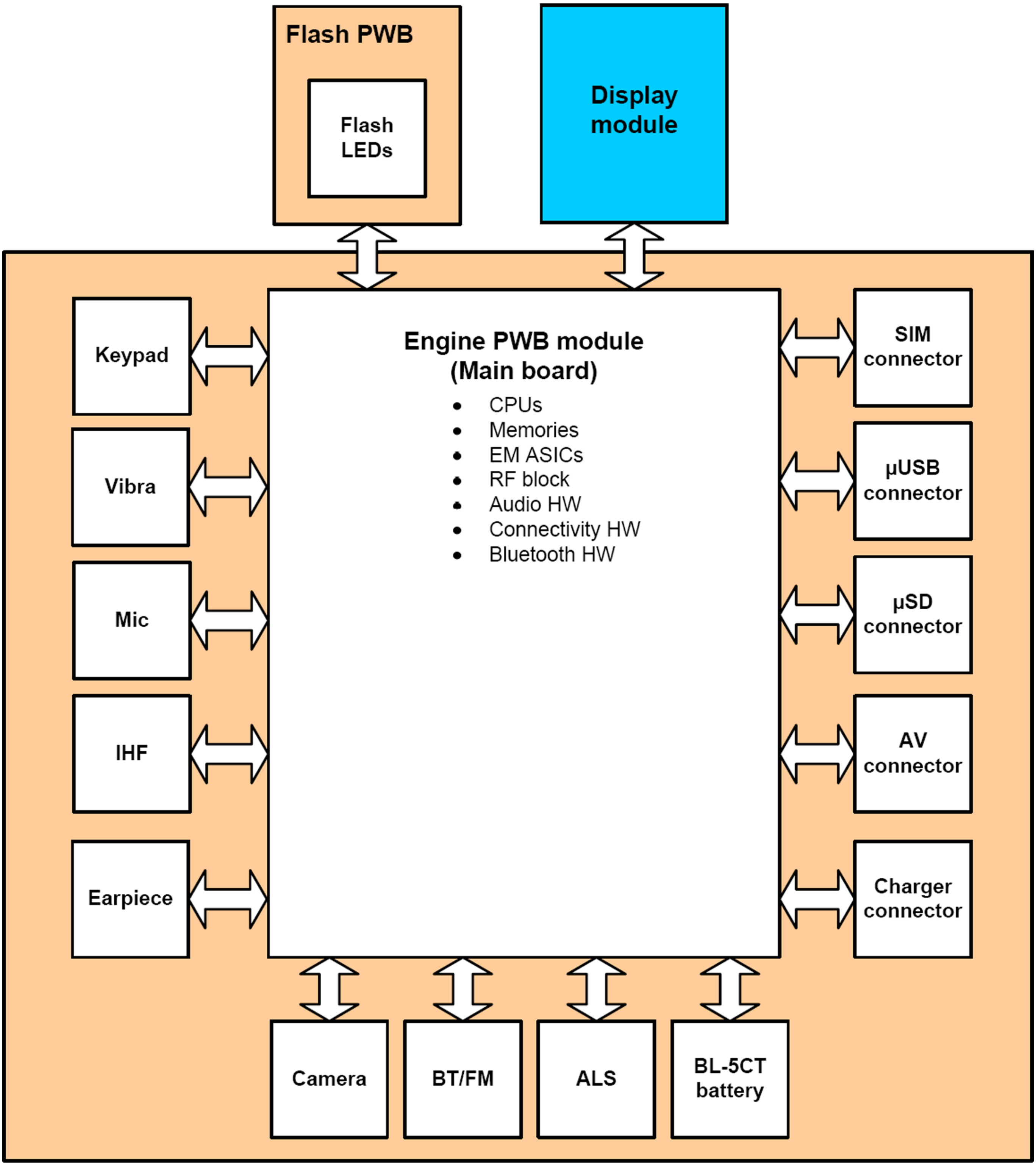

Reminder light LEDs
ALS
Keymat LEDs


Bottom
B2B connector
Camera HW accelerator
BT FM
Betty
Avilma
MicroSD connector
Vibra
Charger connector
Earpiece
AV connector
RAP + Combo memory
Battery connector
SIM connector
FEM
Micro USB connector
RF connector
RF ASIC
Back-up battery
Microphone

System module block diagram


Battery
µUSB connector
Test/Flash interface
Charger
Internal microphone
IHF
AV Jack
Earpiece
Vibra
BB ASIC N2300 BETTY
BB ASIC N2200 AVILMA
SIM
Back-up battery
32.768 kHz
Power key
µSD
Combo memory
ALS
RAP
Display
Keyboard
Camera hardware accelerator
GSM
Bluetooth
FM Radio
Camera with dual LED flash
GSM
BT
Colours
RF
BB

Board and module connections


Flash PWB
Flash LEDs
Display module
Engine PWB module (Main board)
• CPUs
• Memories
• EM ASICs
• RF block
• Audio HW
• Connectivity HW
• Bluetooth HW
Keypad
Vibra
Mic
IHF
Earpiece
SIM connector
µUSB connector
µSD connector
AV connector
Charger connector
Camera
BT/FM
ALS
BL-5CT battery

Energy management

Battery and charging

BL-5CT battery

The phone is powered by a 3-pole BL-5CT 1050 mAh battery. The three poles are named VBAT, BSI and GND where the BSI line is used to recognize the battery capacity. This is done by means of an internal battery pull down resistor.

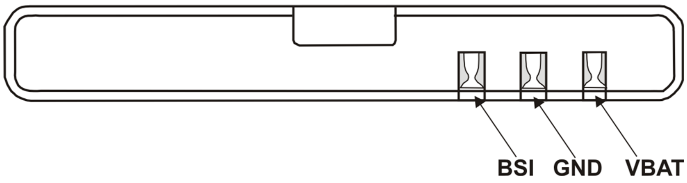


Figure 28 Battery pin order

The battery temperature is estimated by measuring separate battery temperature NTC via the BTEMP line. This is located on the main PWB, at the place where the phone temperature is closest to the battery temperature.

Battery connector

The battery connector is a blade connector. It has three blades;

- BSI (Battery size indicator)
- GND (Ground)
- VBAT (Battery voltage)

The BSI line is used to recognize the battery capacity by a battery internal pull down resistor.

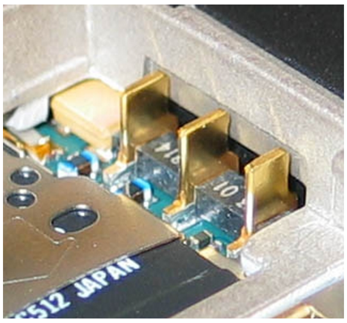


Figure 29 Blade battery connector

Charging

This phone is charged through the smaller Nokia standard interface (2.0 mm plug). The wider standard charger (3.5 mm) can be used together with the CA-44 charger adapter.

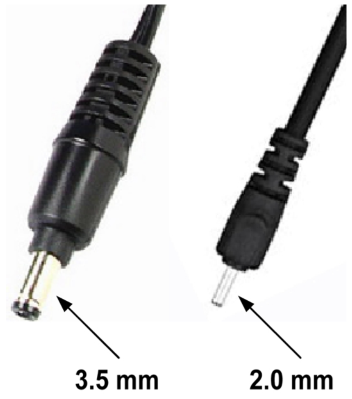


Figure 30 Small (right) and wide (left) charger plugs

The phone can also be charged through the micro USB interface.

Charging is controlled by energy management, and external components are needed to protect the baseband module against EMC, reverse polarity and transient frequency deviation.

Charging a dead battery

Charging of a dead battery has to be carried out via an approved NOKIA charger. Charging of a dead battery via a PC is not allowed since this procedure is not including a current regulator (the battery can be charged with a too high current level).

Normal and extreme voltages

Energy management is mainly carried out in the two Application Specific Integrated Circuits (ASICs) N2300 BETTY and N2200 AVILMA. These two circuits contains a number of regulators. In addition there are some external regulators too.

In the table below normal and extreme voltages are shown when a BL-5CT battery is used.

Table 11 Nominal voltages

Voltage	Voltage [V]	Condition
General Conditions		
Nominal voltage	4.0	
Lower extreme voltage	3.5	
Higher extreme voltage (fast charging)	4.2	
HW Shutdown Voltages		
Vmstr+	2.2 ± 0.1	Off to on
Vmstr-	2.2 ± 0.1	On to off
SW Shutdown Voltages		
Sw shutdown	3.1	In call
Sw shutdown	3.2	In idle
Min Operating Voltage		
Vcoff+	2.9 ± 0.1	Off to on
Vcoff-	2.6 ± 0.1	On to off

Power key and system power-up

When the battery is placed in the phone the power key circuits are energized. When the power key is pressed, the system boots up (if an adequate battery voltage is present).

Power down can be initiated by pressing the power key again (the system is powered down with the aid of SW). The power key is connected to EM ASIC N2200 (AVILMA) via PWRONX signal.

Modes of operation

Mode	Description
NO_SUPPLY	(dead) mode means that the main battery is not present or its voltage is too low (below N2200 AVILMA master reset threshold) and that the back-up battery voltage is too low.
BACK_UP	The main battery is not present or its voltage is too low but back-up battery voltage is adequate and the 32 kHz oscillator is running (RTC is on).
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over N2300 BETTY master reset threshold. All regulators are disabled, PurX is on low state, the RTC is on and the oscillator is on. PWR_OFF (cold) mode is almost the same as PWR_OFF (warm), but the RTC and the oscillator are off.
RESET	RESET mode is a synonym for start-up sequence. RESET mode uses 32 kHz clock to count the REST mode delay (typically 16ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the system's activity is low.
FLASHING	FLASHING mode is for SW downloading.

Connectivity

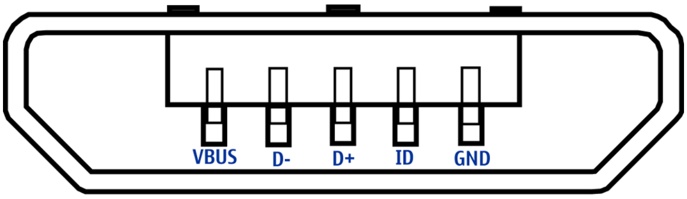
Micro USB interface

The micro USB (Universal Serial Bus) provides a wired connectivity between a PC and peripheral devices. It is a differential serial bus.

USB 2.0 is supported with full speed (12 Mbps).

Hot swap is supported, which means that USB devices may be plugged in/out at any time.

This phone is provided with a specific connector for µUSB.



SIM interface

The device has one SIM (Subscriber Identification Module) interface. It is only accessible if battery is removed. The SIM interface consists of an internal interface between RAP and EM ASIC AVILMA (N2200), and of an external interface between N2200 and SIM contacts.

The SIM IF is shown in the following figure:

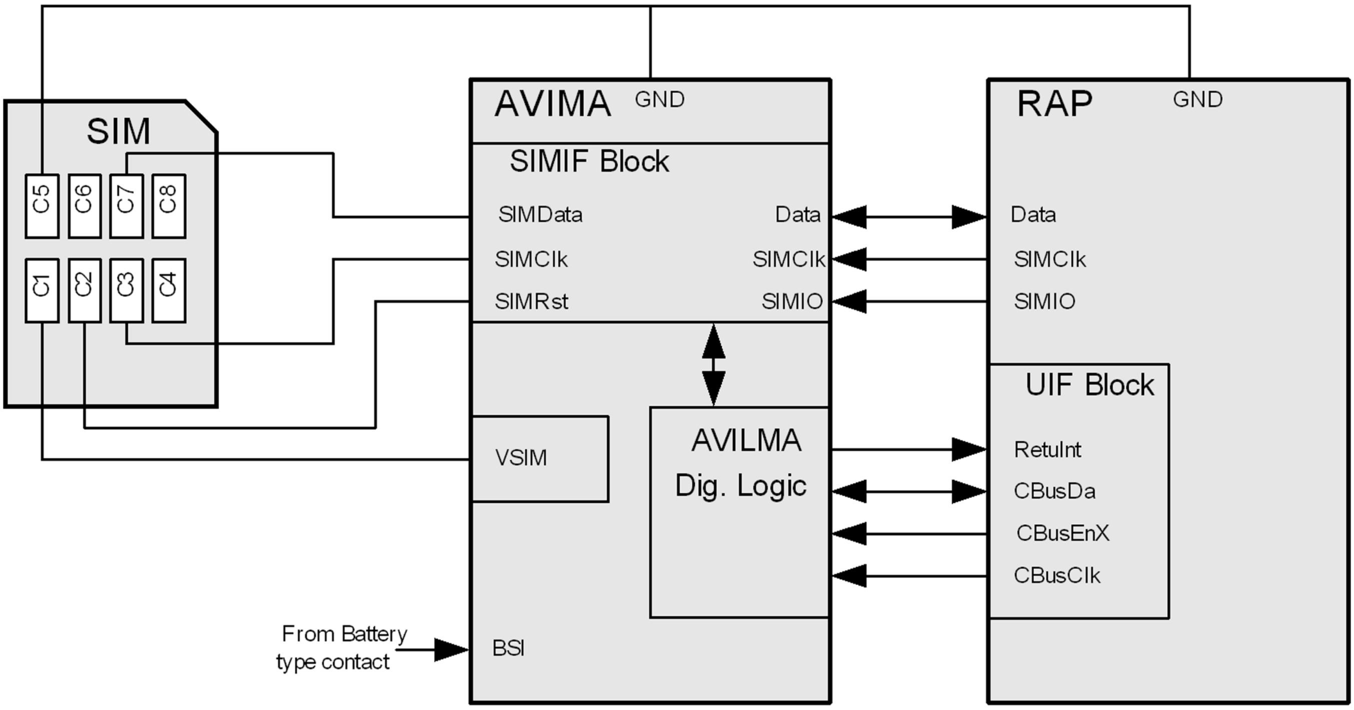

SIM
C5
C6
C7
C8
C1
C2
C3
C4
AVIMA
GND
SIMIF Block
SIMData
SIMClk
SIMRst
Data
SIMClk
SIMIO
VSIM
AVILMA
Dig. Logic
From Battery
type contact
BSI
RAP
GND
Data
SIMClk
SIMIO
UIF Block
RetuInt
CBusDa
CBusEnX
CBusClk

Figure 31 SIM interface

The EM ASIC AVILMA handles the detection of the SIM card. The detection method is based in the BSI line. Because of the location of the SIM card, removing the battery causes a quick power down of the SIM interface.

The SIM interface supports both 1.8 V and 3.0 V SIM cards. The SIM interface voltage is first 1.8 V when the SIM card is inserted, and if the card does not response to the ATR a 3 V interface voltage is used.

MicroSD card interface

The microSD card is connected to the engine via an external level shifter to adapt the 1.8V I/O IF of the RAPS to the 3V IF of the SD IF. The level shifter is a so called integrated level shifter as it additionally contains a 3V LDO to supply the microSD card and components for the ESD/EMC protection of the interface.

The card removal is detected by a push detect switch.

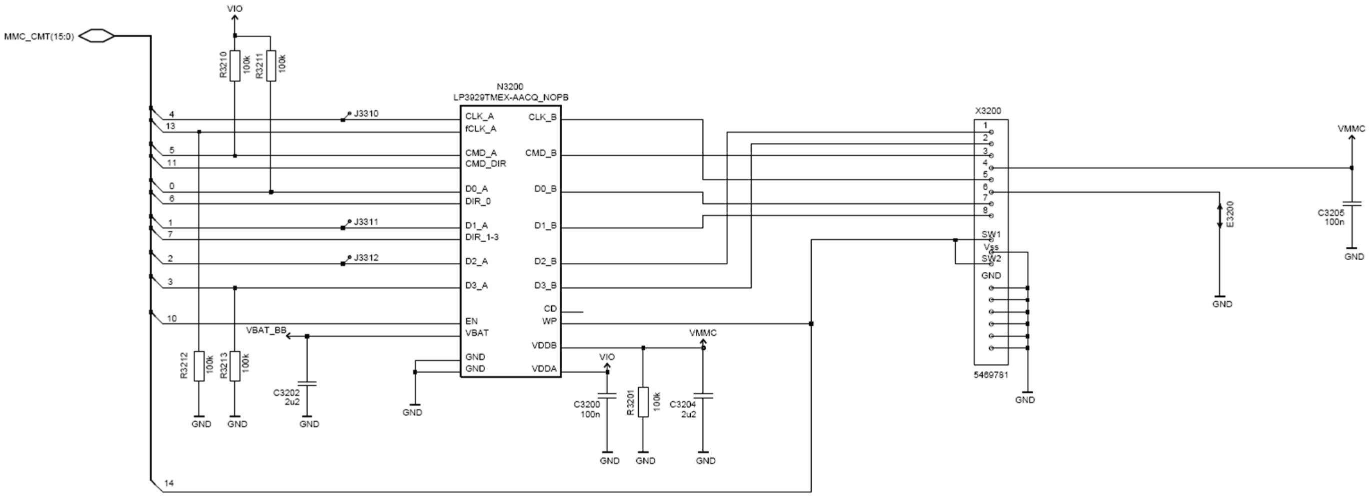

MMC_CMT(15:0)
VIO
R3210
100k
R3211
100k
4
13
5
11
0
6
1
7
2
3
10
14
J3310
J3311
J3312
N3200
LP3929TMEX-AACQ_NOPB
CLK_A
fCLK_A
CMD_A
CMD_DIR
D0_A
DIR_0
D1_A
DIR_1-3
D2_A
D3_A
EN
VBAT
GND
GND
CLK_B
CMD_B
D0_B
D1_B
D2_B
D3_B
CD
WP
VDDB
VDDA
VBAT_BB
R3212
100k
R3213
100k
C3202
2u2
GND
VIO
C3200
100n
R3201
100k
VMMC
C3204
2u2
X3200
1
2
3
4
5
6
7
8
SW1
Vss
SW2
GND
5469781
E3200
VMMC
C3205
100n

Figure 32 MicroSD card engine interface

Charger interface

The charger interface is a 2mm Dynamo charger plug. Older chargers with a 3.5mm plug are supported via the charger adapter cable CA-44.

Charging is controlled by BETTY. Additional external components are needed for EMC purposes, reverse polarity and transient protection of the input to the baseband module.

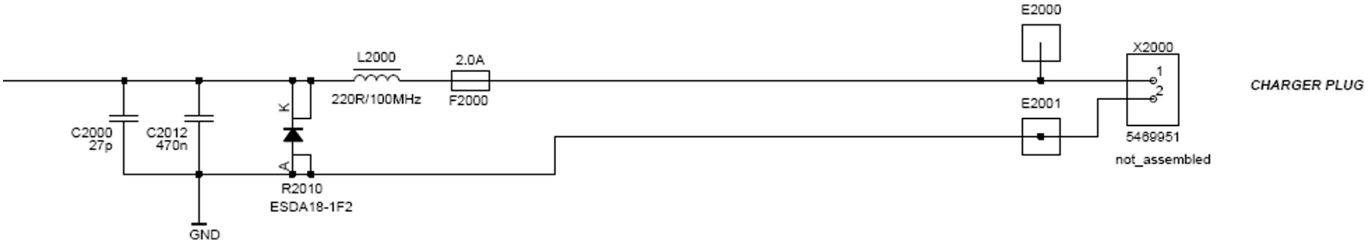

E2000
L2000
2.0A
X2000
1
2
CHARGER PLUG
220R/100MHz
F2000
E2001
K
C2000
27p
C2012
470n
A
5469951
not_assembled
R2010
ESDA18-1F2
GND

Figure 33 Charger interface

AV connector

The 3.5mm AV connector consists of mono or stereo audio output, mono audio input and optional features like control data over microphone line.

A connected male connector is detected on pin 6 (PLUG_DET).

Accessories are detected as basic headset (no ECI) or as intelligent ECI communication devices.

Note: Only use an approved cable for connecting to the AV connector (e.g. headset HS-47).

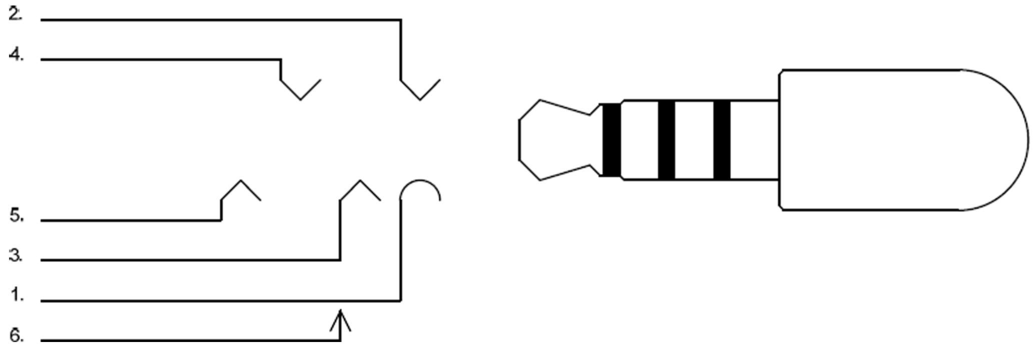


Figure 34 AV connector pin layout

Table 12 AV connector pins

Pin	Signal name	Direction	Description
1, 2	HS_ GND	-	Ground contacts
3	HS_MIC	Input	Multiplexed microphone audio and control data/muxed: MIC2P and ACI, control: GenIO34
4	HS_EAR_R	Output	Audio output (XEAR_R)
5	HS_EAR_L	Output	Audio output (XEAR_L)
6	PLUG_DET	Input	Terminal internal connection, plug detection/ GenIO 33

Bluetooth

The Bluetooth module provides a fully digital link for communication between a master unit (the phone) and one or more slave units (e.g. a wireless headset). Data and control interface for a low power RF module is provided by the module.

The Bluetooth is physically integrated with the FM radio into one discrete module (BTHFMRDS2.2D / N6000).

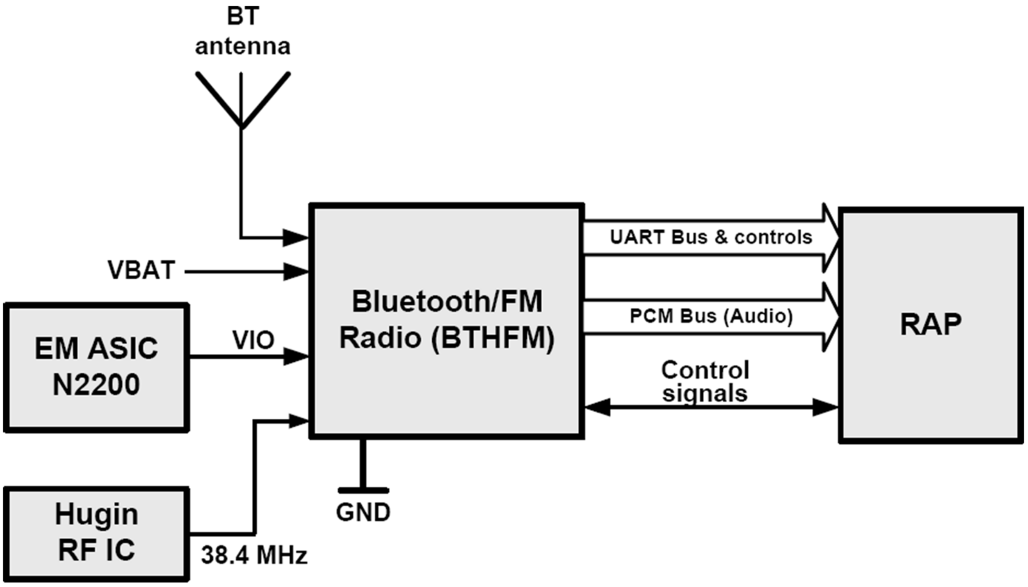

BT
antenna
VBAT
EM ASIC
N2200
VIO
Bluetooth/FM
Radio (BTHFM)
UART Bus & controls
PCM Bus (Audio)
Control
signals
RAP
Hugin
RF IC
38.4 MHz
GND

Figure 35 Bluetooth interface

The Bluetooth antenna has been integrated into the main antenna module assembly. Bluetooth is powered by VBAT and the regulated voltage VIO.

PCM data bus is used for Bluetooth audio applications. In addition UART (universal asynchronous receiver/ transmitter) is used for data communication and controls.

FM radio

The FM radio supports 76 MHz to 108 MHz FM Bands (US /Europe), and RDS/RBDS compatibility. The FM radio is physically integrated with Bluetooth into one single module (BTHFMRDS2.2D / N6000).

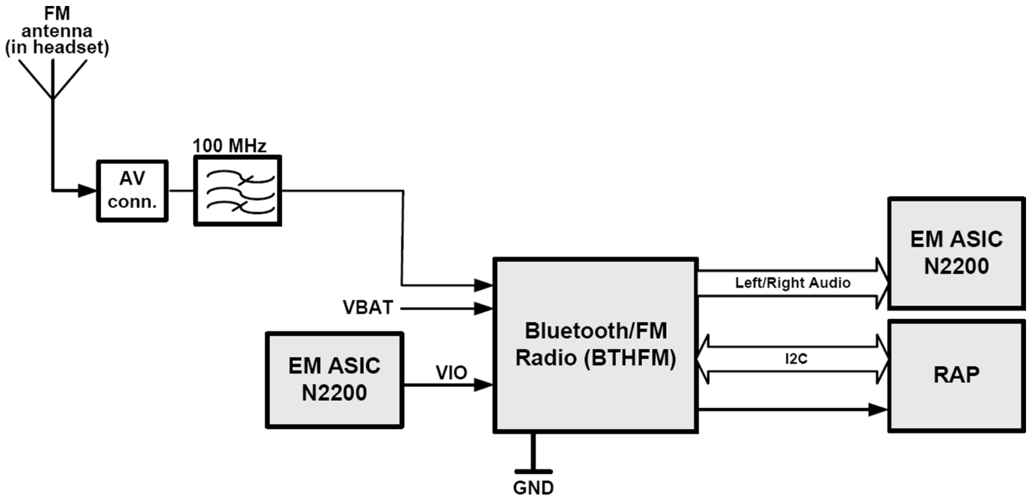

FM
antenna
(in headset)
AV
conn.
100 MHz
VBAT
EM ASIC
N2200
VIO
Bluetooth/FM
Radio (BTHFM)
Left/Right Audio
I2C
EM ASIC
N2200
RAP
GND

Figure 36 FM interface

The FM radio is an integrated circuit, controlled by MCU software via the I2C bus. The wires of the headset are used as elements of the antenna, and no other antenna is needed for FM radio reception.

The radio has an automatic band search function, which can search for a strong station.

Camera concept

Camera characteristics

The device has an integrated high resolution 3.2 Megapixel auto focus digital camera supporting still image and video capture. The camera also has a dual LED flash and a 8 x digital zoom for still pictures. A sequential shot feature allowing the user to take multiple pictures in a quick sequence is also supported.

The auto focus is activated by pressing the dedicated camera button halfway down (the auto focusing result will be indicated in the viewer). The auto focus range is from approximately 0.1 meter to infinity. The lens movement from one extreme to the other is less than 0.5mm, which indicates that great care must be taken when handling the main camera.

The camera module is attached to the bottom side of the main PWB (X1400 socket), and the camera is supported by the DM5011 Julie imaging accelerator (N1400).

Camera flash

The camera has a dual LED flash located next to the camera.

The flash LEDS are located on a separate flash PWB that is attached to the B-cover.

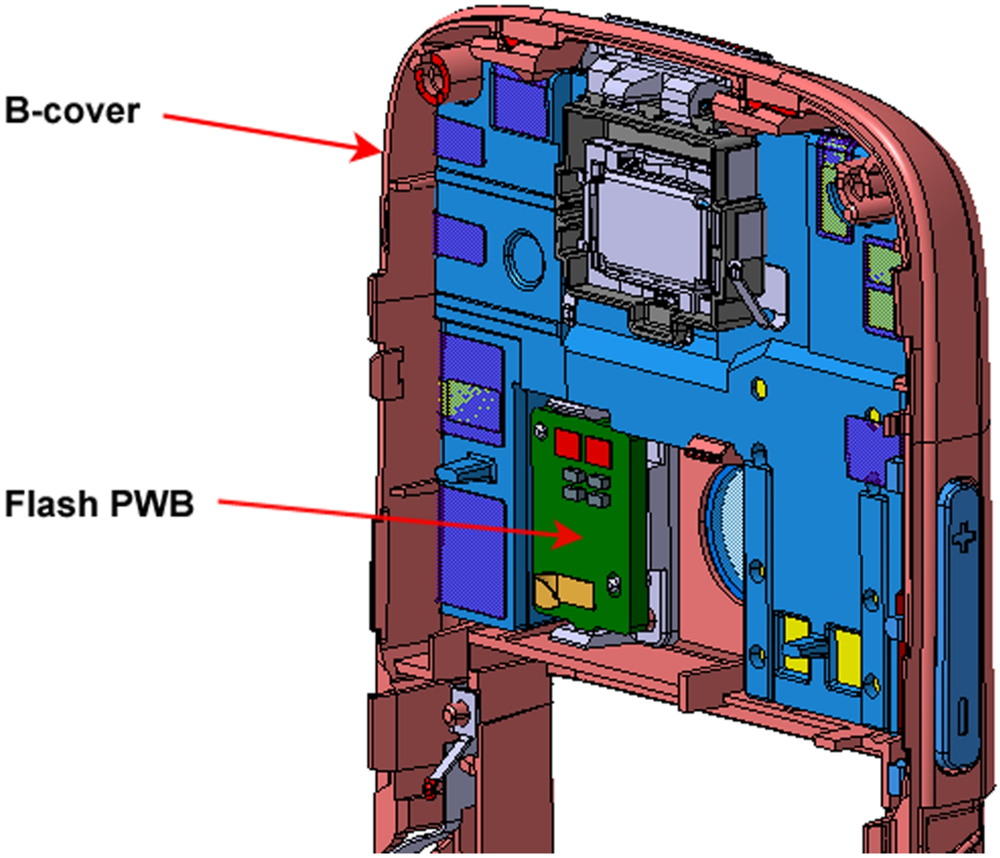


Figure 37 Camera flash main components

The flash LEDs (V1200, V1201) are located on the top side of the flash PWB.

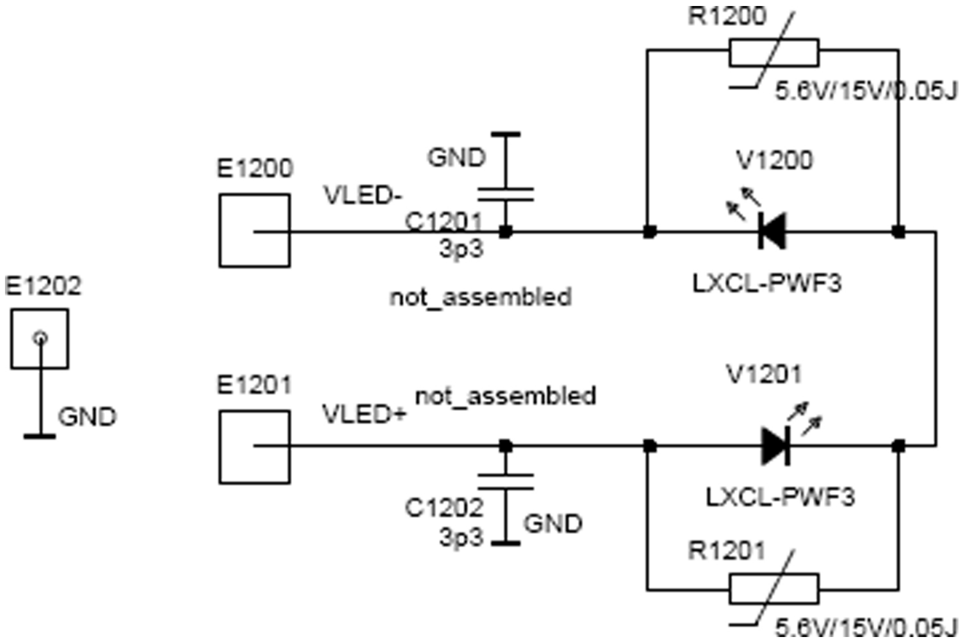

R1200
5.6V/15V/0.05J
E1200
GND
VLED-
C1201
3p3
V1200
LXCL-PWF3
not_assembled
E1202
GND
E1201
VLED+
not_assembled
V1201
LXCL-PWF3
C1202
3p3
GND
R1201
5.6V/15V/0.05J

Figure 38 Design for camera flash LEDs

The flash LED driver (N1450) is located on the bottom side of the main PWB.

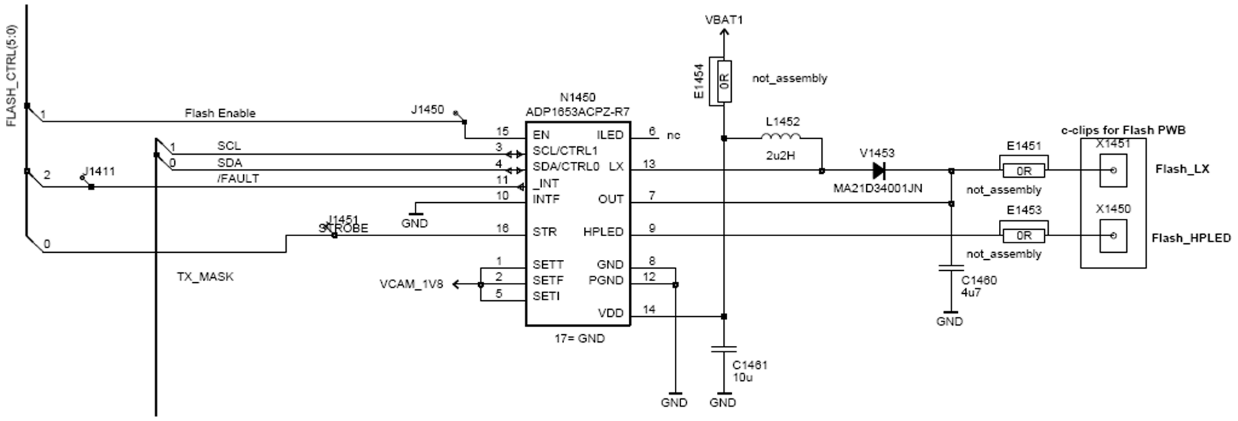

FLASH_CTRL(5:0)
VBAT1
E1454
0R
not_assembly
Flash Enable
J1450
N1450
ADP1653ACPZ-R7
L1452
2u2H
SCL
SDA
/FAULT
J1411
EN
SCL/CTRL1
SDA/CTRL0
_INT
INTF
ILED
LX
OUT
nc
V1453
MA21D34001JN
E1451
0R
not_assembly
E1453
0R
not_assembly
c-clips for Flash PWB
X1451
Flash_LX
X1450
Flash_HPLED
J1451
STROBE
GND
STR
HPLED
TX_MASK
VCAM_1V8
SETT
SETF
SETI
GND
PGND
VDD
17= GND
C1460
4u7
GND
C1461
10u
GND
GND

Figure 39 Camera flash LED driver design

User interface

Display module

The display module consists of the following:

- A main 2.2" 240 x 320 TFT display with 16M colors

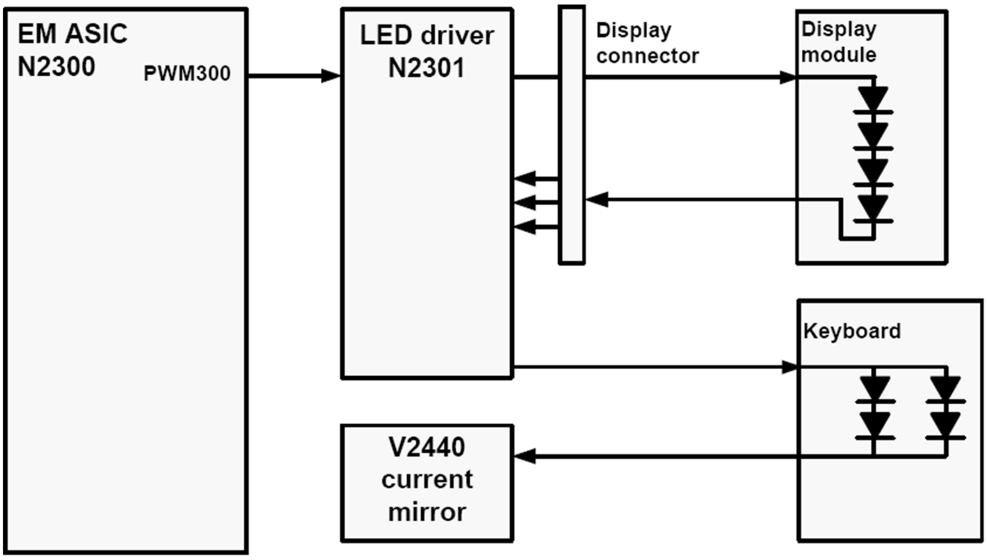
The interconnection between the display module and RAP engine is implemented with a 24-pin board-to-board connector. The display module is equipped with a driver with bi-directional 8-bit parallel interfaces.

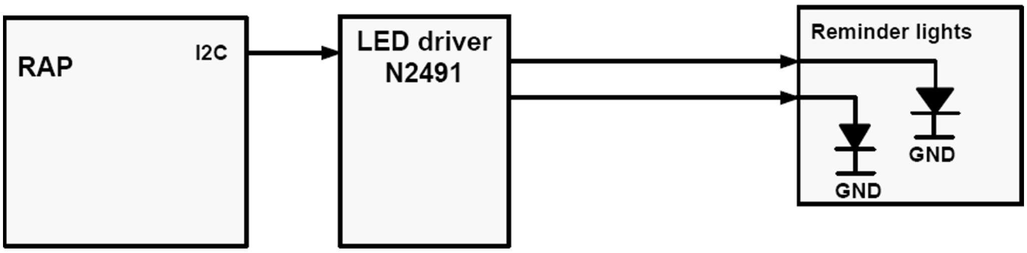
If the display is found to be faulty, the entire display module must be replaced.

Backlights and illumination

The device has the following backlights:

- 4 display backlight LEDs (included in the display module) controlled by the N2301 LED driver
- 4 keymat backlight LEDs (V2500,V2502,V2504,V2506) controlled by N2301 LED driver
- 2 reminder light LEDs (V2512, V2513) controlled by N2491 LED driver


EM ASIC
N2300
PWM300
LED driver
N2301
Display
connector
Display
module
Keyboard
V2440
current
mirror


RAP
I2C
LED driver
N2491
Reminder lights
GND
GND

Digital Ambient Light Sensor (ALS)

The digital Ambient Light Sensor (N2460) is used to monitor the lighting conditions. The sensor is located at the top side of the main PWB.

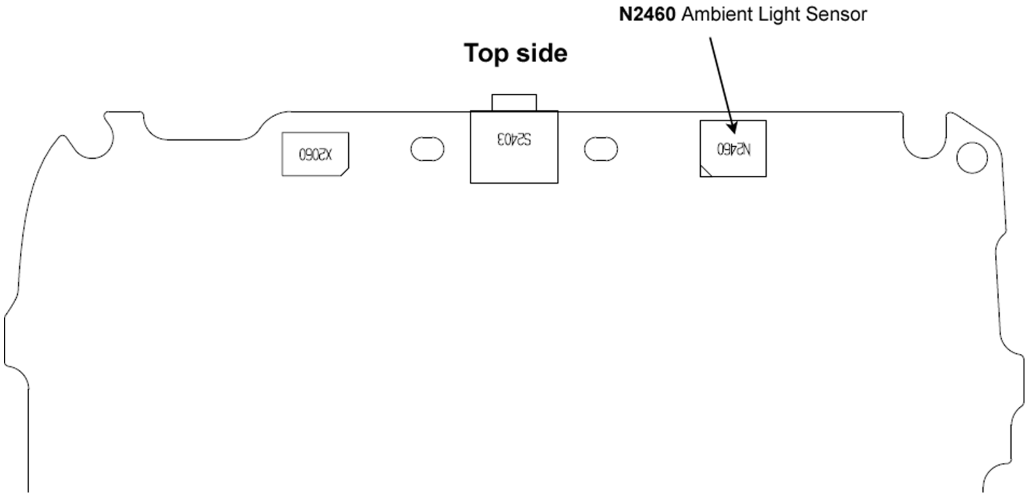

N2460 Ambient Light Sensor
Top side
X2060
S2403
N2460

Figure 40 Ambient Light Sensor location

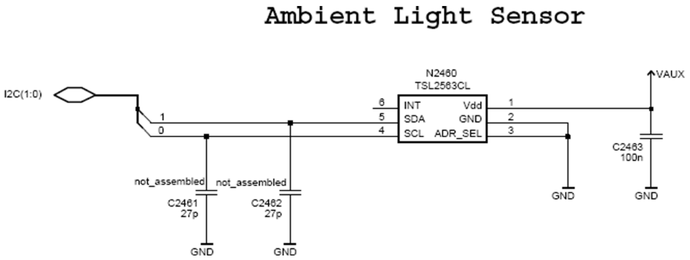

Ambient Light Sensor
I2C(1:0)
N2460
TSL2563CL
INT
SDA
SCL
Vdd
GND
ADR_SEL
6
5
4
1
2
3
1
0
VAUX
C2463
100n
GND
GND
not_assembled
not_assembled
C2461
27p
C2462
27p
GND
GND

Figure 41 Ambient Light Sensor design

The ALS light guide is located at the top side of the UI shielding assembly.

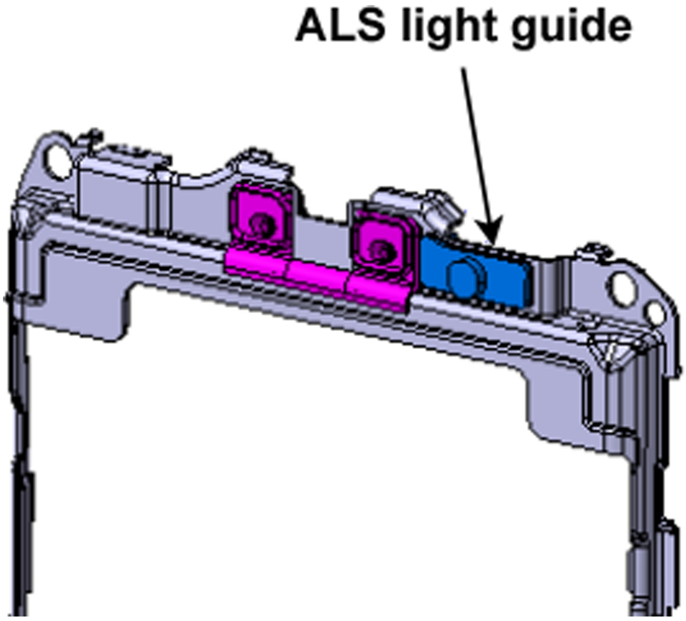

ALS light guide

Figure 42 ALS light guide location

Combo memory

The combo memory (D3000) is stacked on top of RAPS. The combo itself consists of a 256 Mbit DDR SDRAM die stacked on top of a 512 Mbit NOR flash memory in a POP2 package.

The RAPS memory connections support NOR flash densities up to 2x512 Mbit, DDR SDRAM densities up to 512 Mbit, and Mass Memory densities of several gigabits.

Audio

Audio concept

The functional core of the audio hardware is built aroundthe EM ASIC N2200 and RAP.

EM ASIC N2200 provides an interface for the trancducers. Integrated hands free (IHF) speaker is driven by a D-class audio amplifier.

There are three audio transducers:

- 1 digital microphone
- 1 earpiece
- 1 IHF (internal handsfree) speaker

EM ASIC N2200 also provides an output for the vibra motor.

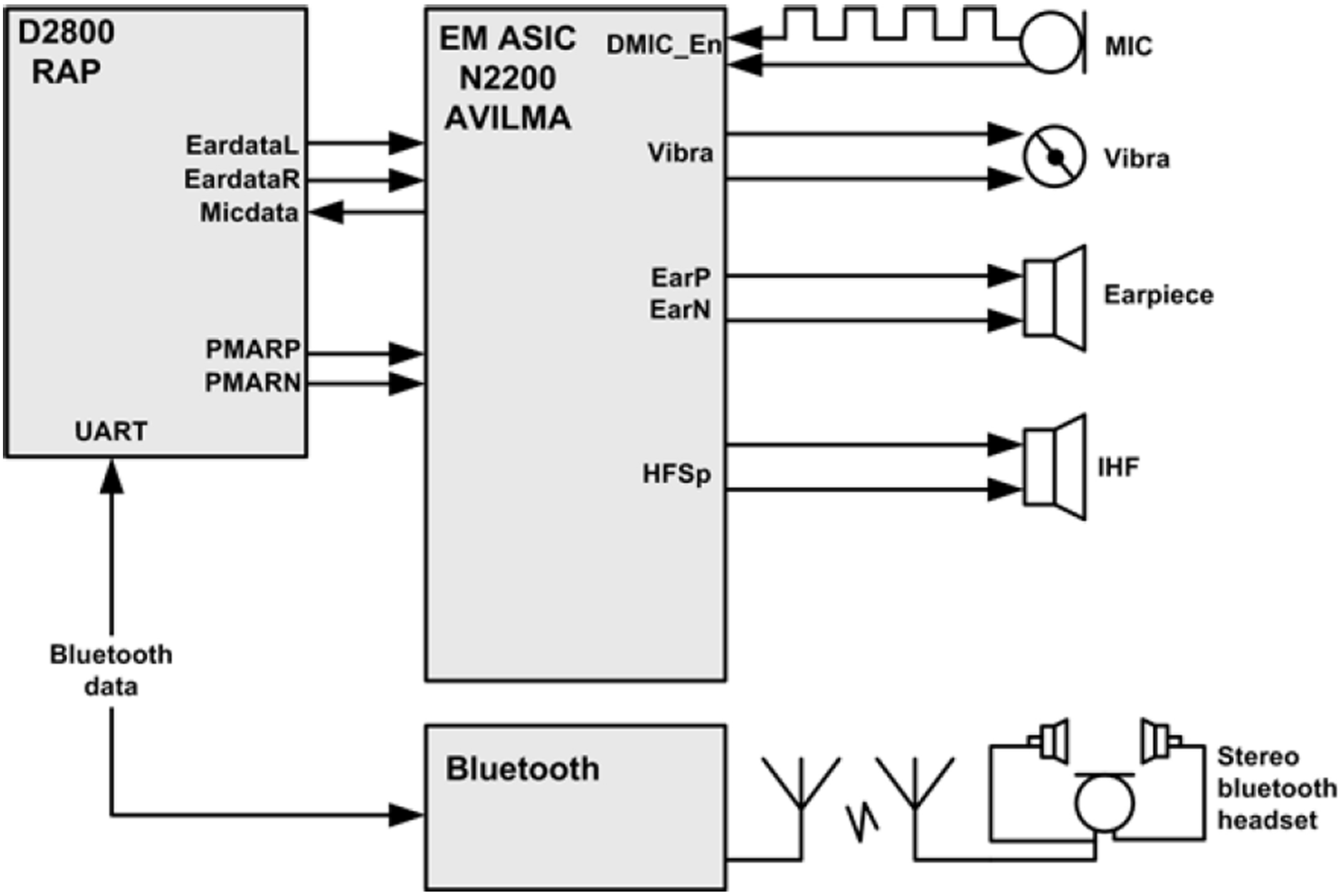

D2800
RAP
EardataL
EardataR
Micdata
PMARP
PMARN
UART
EM ASIC
N2200
AVILMA
DMIC_En
Vibra
EarP
EarN
HFSp
MIC
Vibra
Earpiece
IHF
Bluetooth
data
Bluetooth
Stereo
bluetooth
headset

Figure 43 Audio block diagram

Internal microphone

The digital internal microphone (B2150) is located at the bottom side of the main board. To save current when the microphone is not needed, its supply voltage is controlled by VSIM2. The Data and Clk lines are directly connected to RAPS.

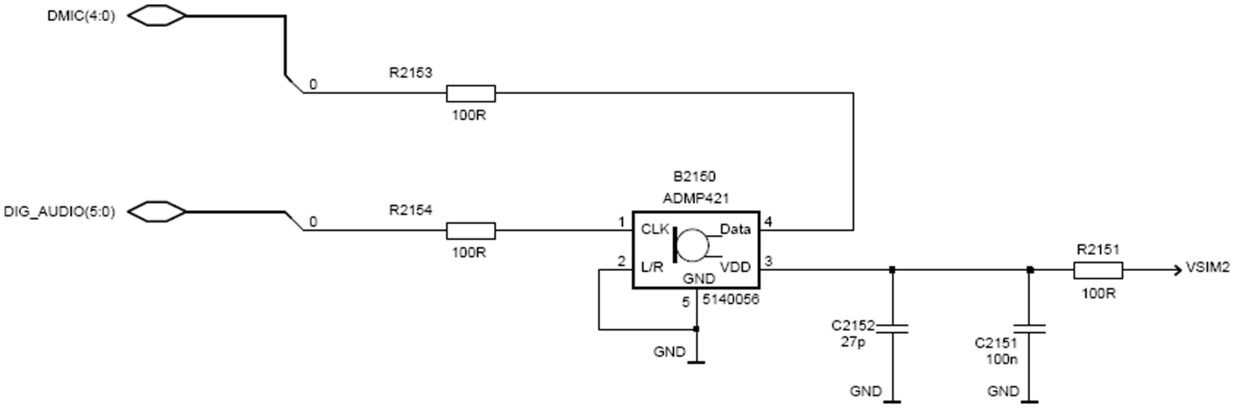

DMIC(4:0)
0
R2153
100R
DIG_AUDIO(5:0)
0
R2154
100R
B2150
ADMP421
1
CLK
Data
4
2
L/R
VDD
3
GND
5
5140056
GND
C2152
27p
GND
C2151
100n
GND
R2151
100R
VSIM2

Figure 44 Internal microphone design

Internal earpiece

The internal earpiece (B2103) is located at the bottom side of the main PWB. The earpiece is directly driven by the internal ear amplifiers of the AVILMA and no additional amplifier is used.

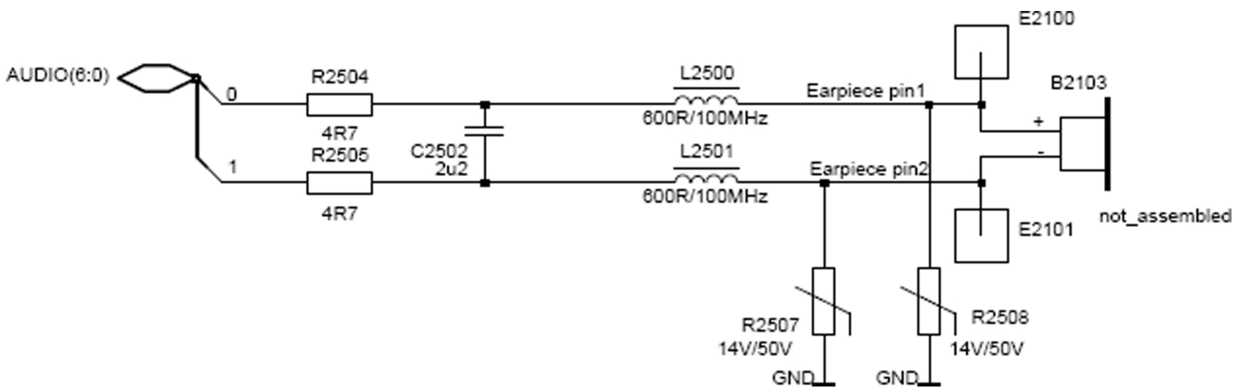

AUDIO(6:0)
0
1
R2504
4R7
R2505
4R7
C2502
2u2
L2500
600R/100MHz
L2501
600R/100MHz
Earpiece pin1
Earpiece pin2
E2100
B2103
+
-
E2101
not_assembled
R2507
14V/50V
R2508
14V/50V
GND
GND

Figure 45 Internal earpiece

IHF speaker

The IHF speaker (E2165/E2166) is located at the bottom side of the main board. No additional amplifier is used.

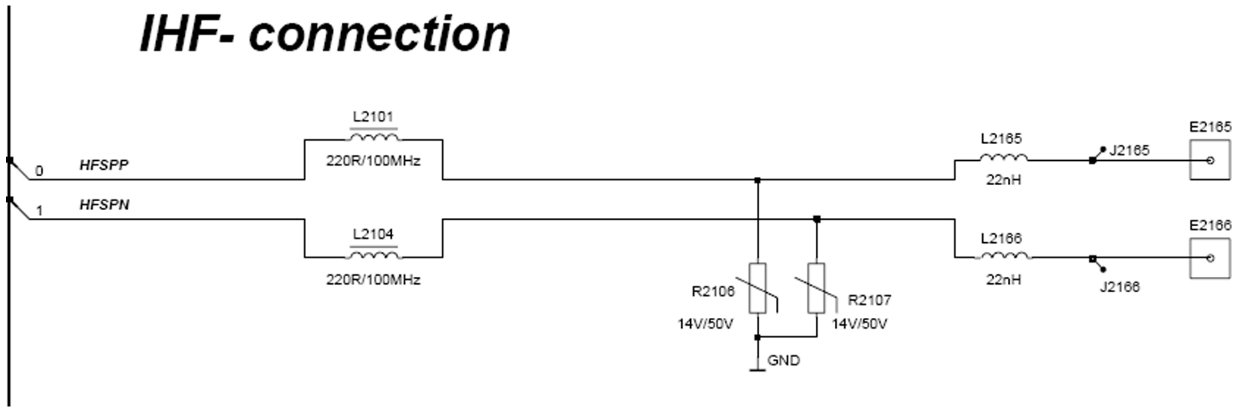

IHF- connection
0
HFSPP
1
HFSPN
L2101
220R/100MHz
L2104
220R/100MHz
R2106
14V/50V
R2107
14V/50V
GND
L2165
22nH
L2166
22nH
J2165
J2166
E2165
E2166

Figure 46 IHF speaker

External microphone

An external microphone can be connected to the device via the 3.5mm AV connector (X2101) located at the bottom side of the main board.

The external microphone connection is able to use ECI data as well. Thus an analogue switch is applied to the path. The switch is controlled by GenIO 43.

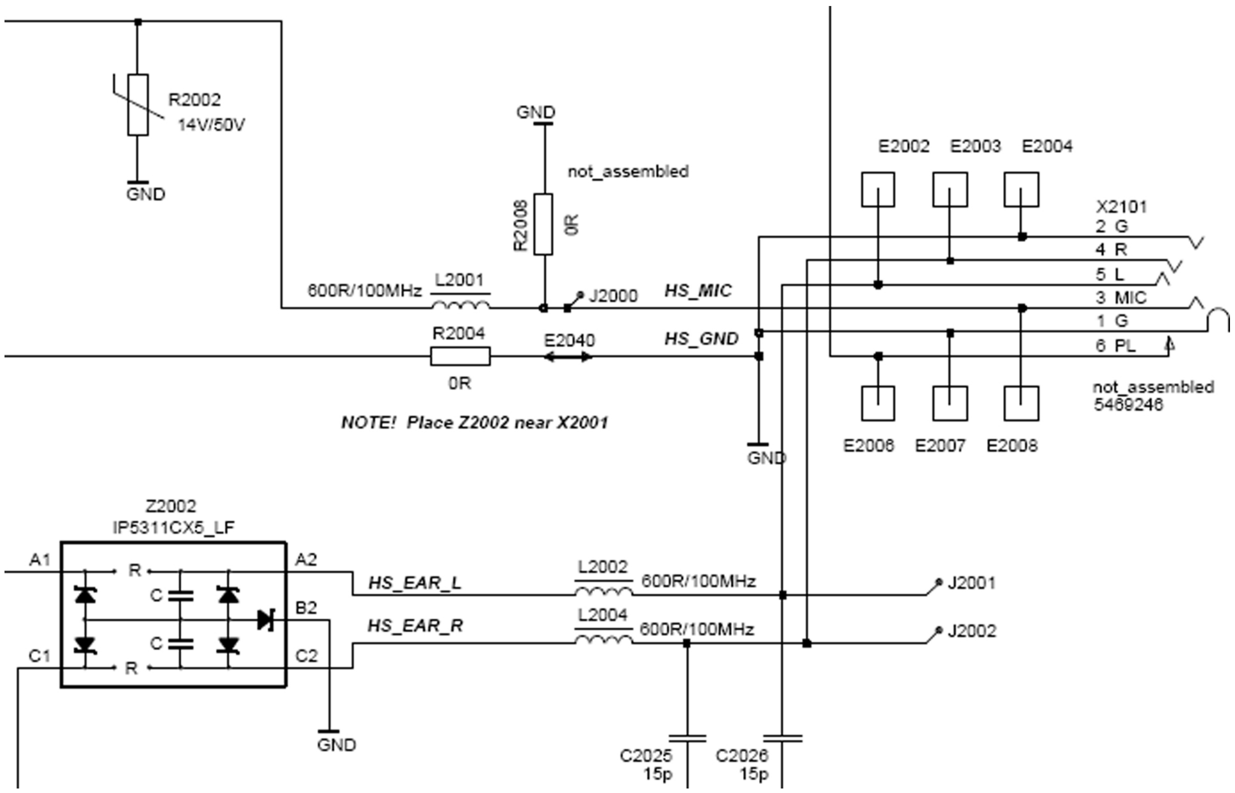

R2002
14V/50V
GND
GND
not_assembled
R2008
0R
600R/100MHz
L2001
J2000
HS_MIC
R2004
E2040
HS_GND
0R
NOTE! Place Z2002 near X2001
E2002
E2003
E2004
X2101
2 G
4 R
5 L
3 MIC
1 G
6 PL
not_assembled
5469246
E2006
E2007
E2008
GND
Z2002
IP5311CX5_LF
A1
R
C
C
R
C1
A2
B2
C2
GND
HS_EAR_L
HS_EAR_R
L2002
600R/100MHz
L2004
600R/100MHz
J2001
J2002
C2025
15p
C2026
15p

Figure 47 AV connector design

External earpiece

An external earpiece can be connected to the device via the 3.5mm AV connector (X2101) located at the bottom side of the main board.

TPA6130 (N2000), located at the bottom side of the main board, is needed for the AV interface as a power amplifier with volume control. This analogue stereo amplifier may be controlled via the I^{2}C for volume adjustment and setup of the output channels.

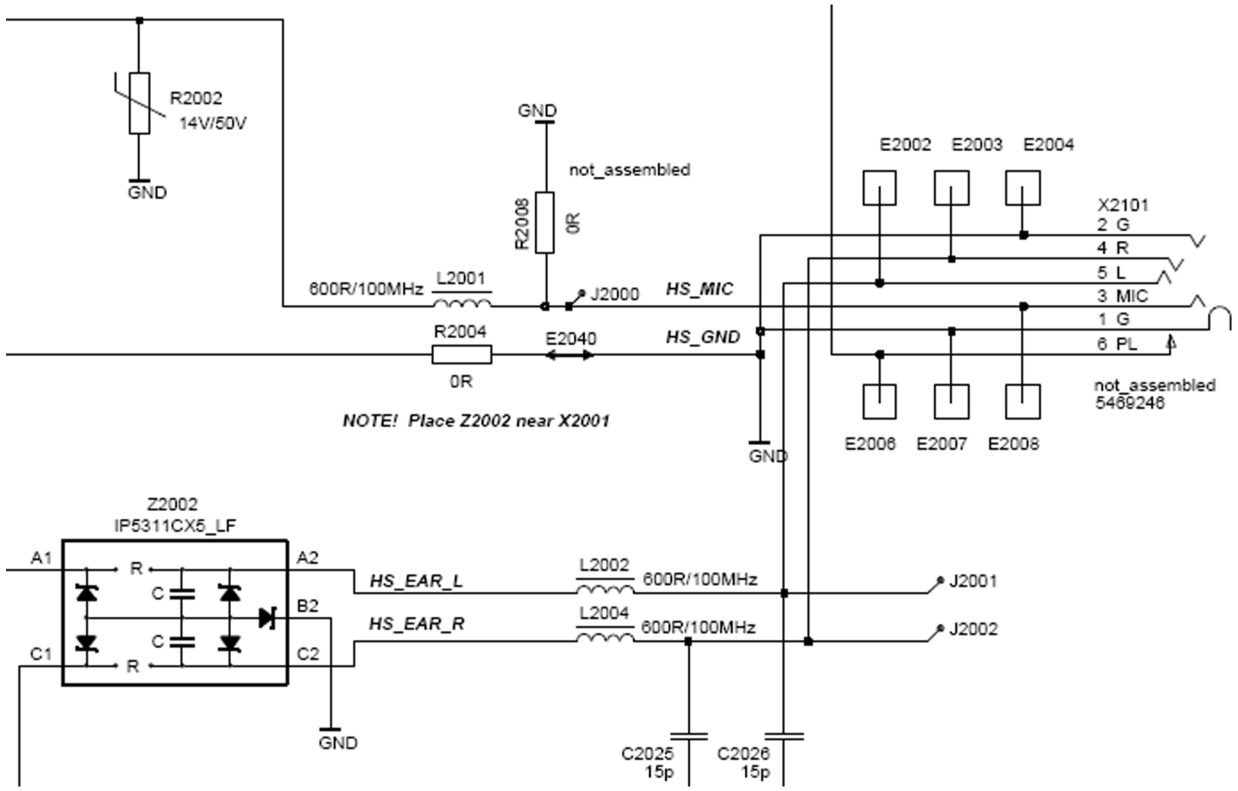

R2002
14V/50V
GND
GND
not_assembled
R2008
0R
600R/100MHz
L2001
J2000
HS_MIC
R2004
0R
E2040
HS_GND
NOTE! Place Z2002 near X2001
E2002
E2003
E2004
X2101
2 G
4 R
5 L
3 MIC
1 G
6 PL
not_assembled
5469246
E2006
E2007
E2008
GND
Z2002
IP5311CX5_LF
A1
R
C
C
R
C1
A2
B2
C2
GND
HS_EAR_L
HS_EAR_R
L2002
600R/100MHz
L2004
600R/100MHz
J2001
J2002
C2025
15p
C2026
15p

Figure 48 AV connector design

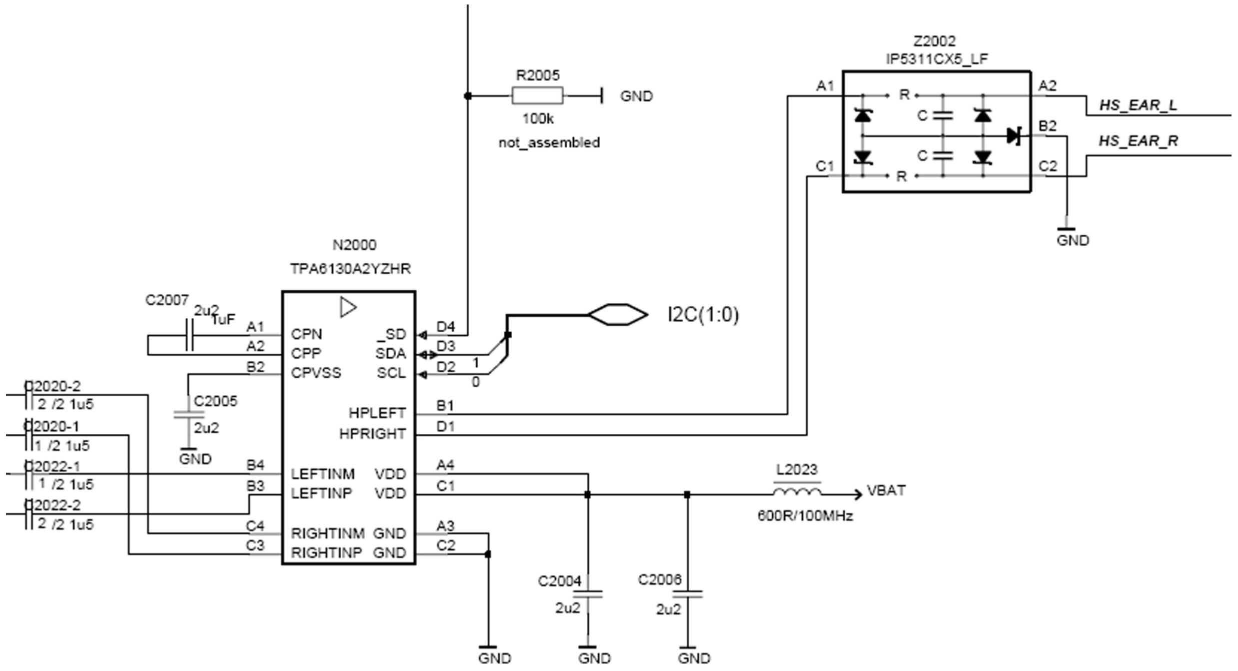

R2005
100k
not_assembled
GND
Z2002
IP5311CX5_LF
A1
R
C
C
R
C1
A2
B2
C2
HS_EAR_L
HS_EAR_R
GND
N2000
TPA6130A2YZHR
C2007
2u2
1uF
A1
A2
B2
CPN
CPP
CPVSS
_SD
SDA
SCL
D4
D3
D2
1
0
I2C(1:0)
C2020-2
2 /2 1u5
C2020-1
1 /2 1u5
C2022-1
1 /2 1u5
C2022-2
2 /2 1u5
C2005
2u2
GND
HPLEFT
HPRIGHT
B1
D1
B4
B3
LEFTINM
LEFTINP
VDD
VDD
A4
C1
C4
C3
RIGHTINM
RIGHTINP
GND
GND
A3
C2
L2023
600R/100MHz
VBAT
C2004
2u2
C2006
2u2
GND
GND
GND

Figure 49 AV interface power amplifier TPA6130

Vibra

The vibra (M2101) is a mounted SMD located at the bottom side of the main board. It is supplied directly from AVILMA's Vibra outputs.

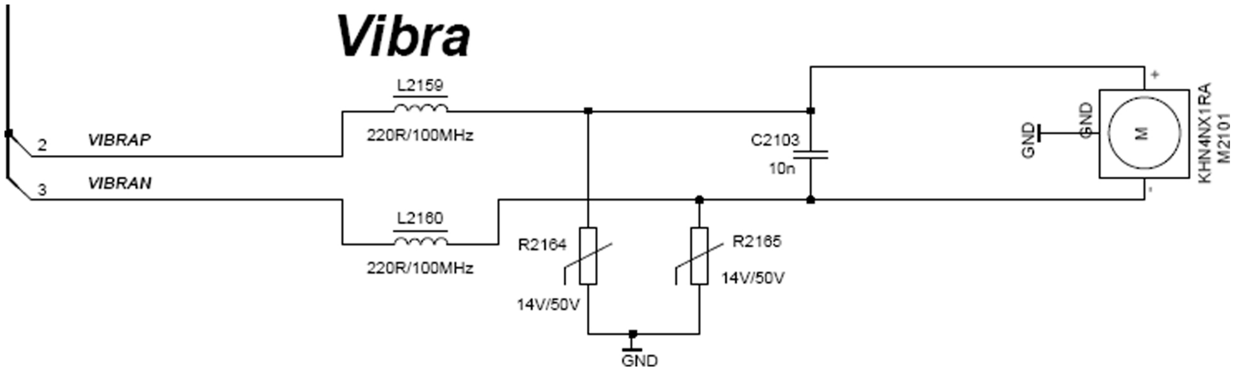

Vibra
L2159
220R/100MHz
L2160
220R/100MHz
2
VIBRAP
3
VIBRAN
R2164
14V/50V
R2165
14V/50V
C2103
10n
GND
GND
GND
M
KHN4NX1RA
M2101
+
-

Figure 50 Vibra design

RF description

RF block

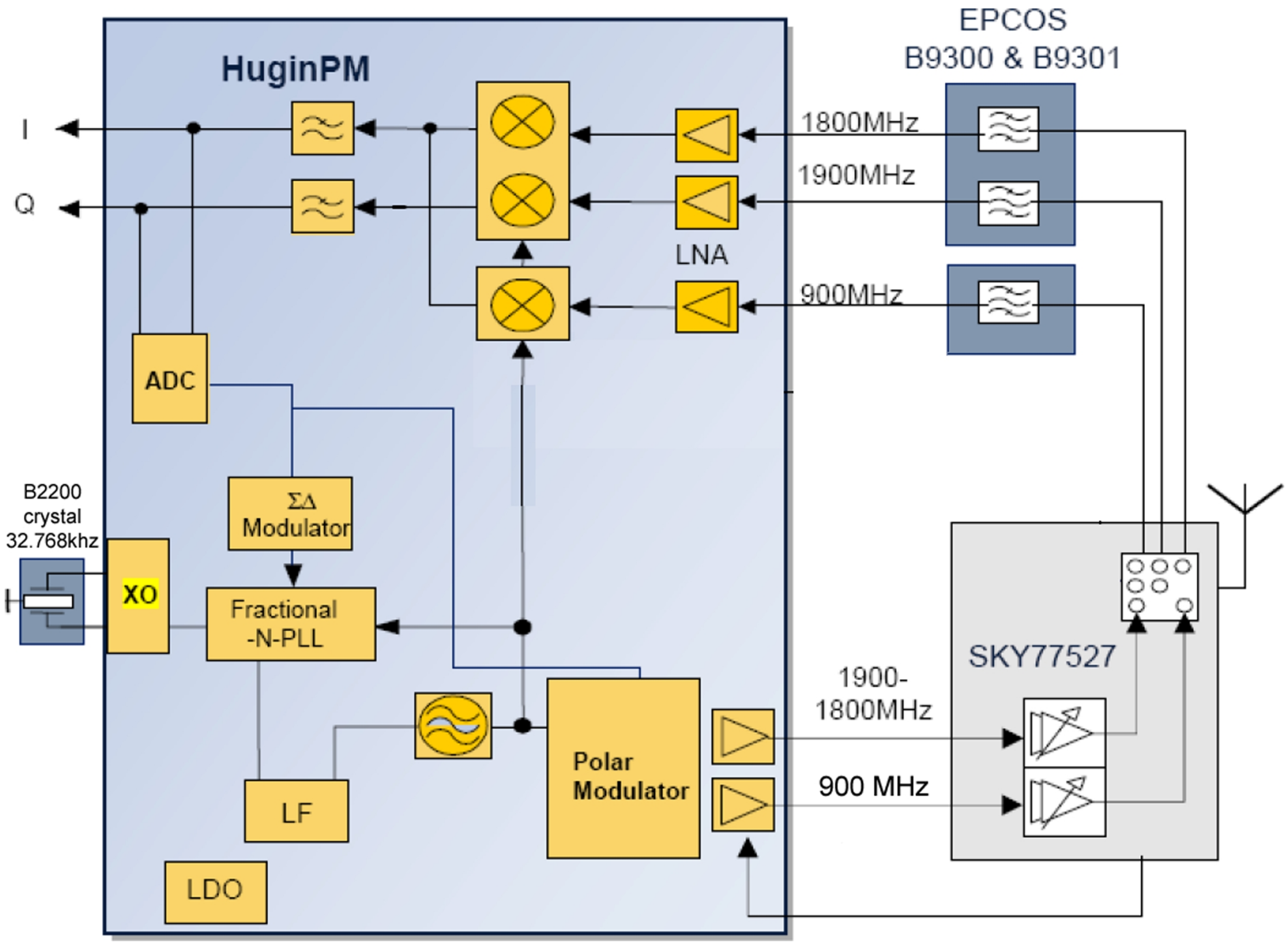

HuginPM
EPCOS
B9300 & B9301
I
Q
1800MHz
1900MHz
LNA
900MHz
ADC
B2200
crystal
32.768khz
XO
ΣΔ
Modulator
Fractional
-N-PLL
LF
LDO
Polar
Modulator
1900-
1800MHz
900 MHz
SKY77527

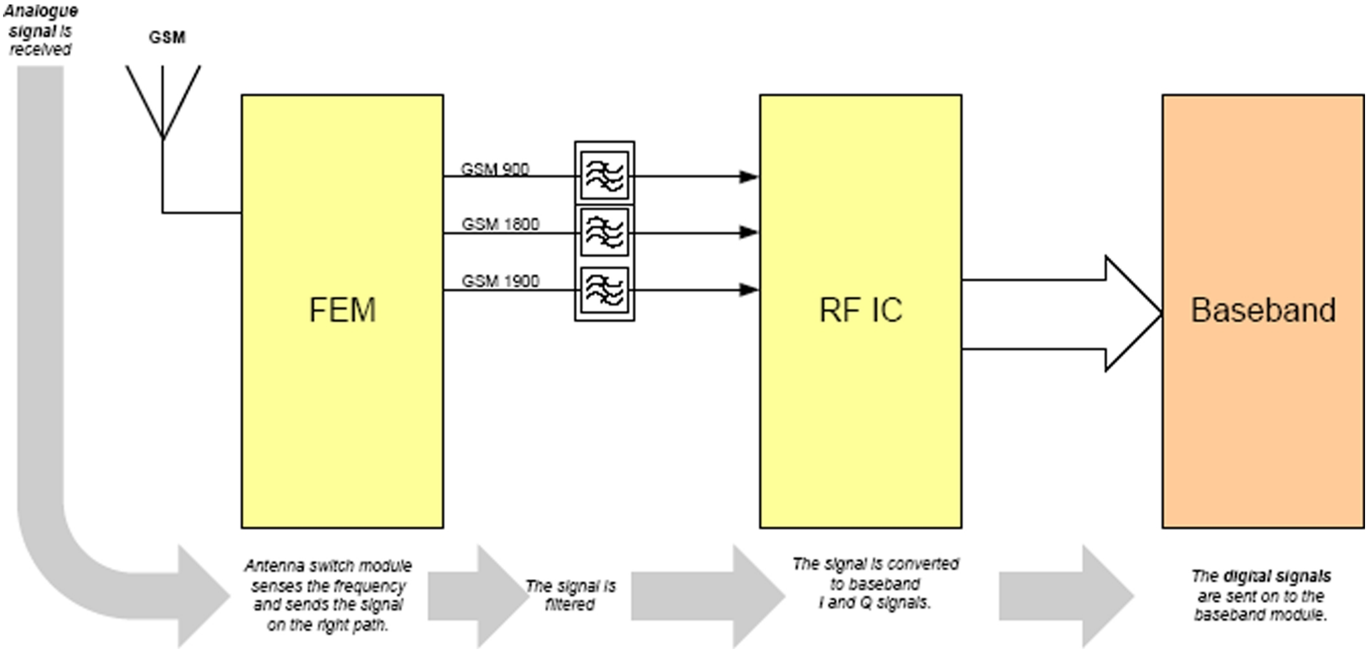
Figure 51 RF block diagram

Receiver (RX)

An analogue signal is received by the phone's antenna. The signal is converted to a digital signal and is then transferred further to the baseband (eg. to the earpiece).

The receiver functions are implemented in the RF ASIC.

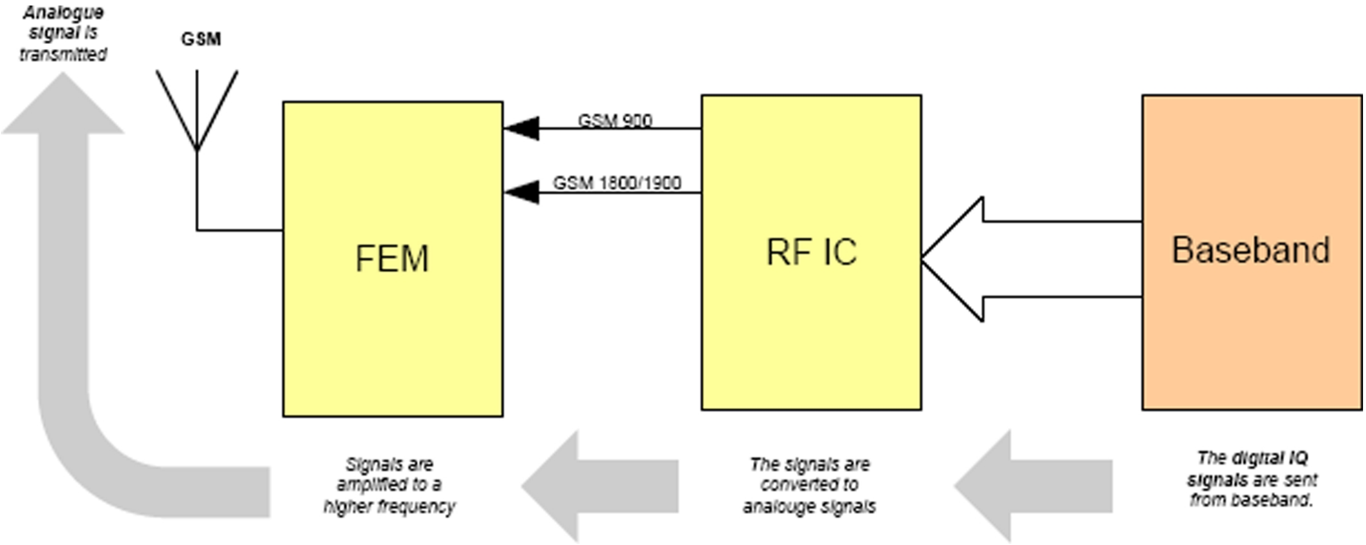
Signals with different frequencies take different paths, therefore being handled by different components.


Analogue signal is received
GSM
FEM
GSM 900
GSM 1800
GSM 1900
RF IC
Baseband
Antenna switch module senses the frequency and sends the signal on the right path.
The signal is filtered
The signal is converted to baseband I and Q signals.
The digital signals are sent on to the baseband module.

Transmitter (TX)

The digital baseband signal (e.g. from the microphone) is converted to an analogue signal, which is then amplified and transmitted from the antenna. The frequency of this signal can be tuned to match the bandwidth of the system in use (e.g. GSM900).

The transmitter functions are implemented in the RF ASIC.


Analogue signal is transmitted
GSM
FEM
GSM 900
GSM 1800/1900
RF IC
Baseband
Signals are amplified to a higher frequency
The signals are converted to analouge signals
The digital IQ signals are sent from baseband.

Glossary

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A/D-converter	Analogue-to-digital converter
ACI	Accessory Control Interface
ADC	Analogue-to-digital converter
ADSP	Application DPS (expected to run high level tasks)
AGC	Automatic gain control (maintains volume)
ALS	Ambient light sensor
AMSL	After Market Service Leader
ARM	Advanced RISC Machines
ARPU	Average revenue per user (per month or per year)
ASIC	Application Specific Integrated Circuit
ASIP	Application Specific Interface Protector
B2B	Board to board, connector between PWB and UI board
BB	Baseband
BC02	Bluetooth module made by CSR
BIQUAD	Bi-quadratic (type of filter function)
BSI	Battery Size Indicator
BT	Bluetooth
CBus	MCU controlled serial bus connected to UPP_WD2, UEME and Zocus
CCP	Compact Camera Port
CDMA	Code division multiple access
CDSP	Cellular DSP (expected to run at low levels)
CLDC	Connected limited device configuration
CMOS	Complimentary metal-oxide semiconductor circuit (low power consumption)
COF	Chip on Foil
COG	Chip on Glass
CPU	Central Processing Unit
CSD	Circuit-switched data
CSR	Cambridge silicon radio
CSTN	Colour Super Twisted Nematic
CTSI	Clock Timing Sleep and interrupt block of Tiku
CW	Continuous wave
D/A-converter	Digital-to-analogue converter
DAC	Digital-to-analogue converter
DBI	Digital Battery Interface
DBus	DSP controlled serial bus connected between UPP_WD2 and Helgo
DCT-4	Digital Core Technology

DMA	Direct memory access
DP	Data Package
DPLL	Digital Phase Locked Loop
DSP	Digital Signal Processor
DTM	Dual Transfer Mode
DtoS	Differential to Single ended
EDGE	Enhanced data rates for global/GSM evolution
EGSM	Extended GSM
EM	Energy management
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
ESD	Electrostatic discharge
FCI	Functional cover interface
FPS	Flash Programming Tool
FR	Full rate
FSTN	Film compensated super twisted nematic
GMSK	Gaussian Minimum Shift Keying
GND	Ground, conductive mass
GPIB	General-purpose interface bus
GPRS	General Packet Radio Service
GSM	Group Special Mobile/Global System for Mobile communication
HF	Hands free
HFCM	Handsfree Common
HS	Handset
HW	Hardware
I/O	Input/Output
IBAT	Battery current
IC	Integrated circuit
ICHAR	Charger current
IF	Interface
IHF	Integrated hands free
IMEI	International Mobile Equipment Identity
IR	Infrared
IrDA	Infrared Data Association
ISA	Intelligent software architecture
JPEG/JPG	Joint Photographic Experts Group

LCD	Liquid Crystal Display
LDO	Low Drop Out
LED	Light-emitting diode
LPRF	Low Power Radio Frequency
MCU	Micro Controller Unit (microprocessor)
MCU	Multiport control unit
MIC, mic	Microphone
MIDP	Mobile Information Device Profile
MIN	Mobile identification number
MIPS	Million instructions per second
MMC	Multimedia card
MMS	Multimedia messaging service
MTP	Multipoint-to-point connection
NTC	Negative temperature coefficient, temperature sensitive resistor used as a temperature sensor
OMA	Object management architecture
OMAP	Operations, maintenance, and administration part
Opamp	Operational Amplifier
PA	Power amplifier
PDA	Pocket Data Application
PDA	Personal digital assistant
PDRAM	Program/Data RAM (on chip in Tiku)
Phoenix	Software tool of DCT4.x and BB5
PIM	Personal Information Management
PLL	Phase locked loop
PM	(Phone) Permanent memory
PUP	General Purpose IO (PIO), USARTS and Pulse Width Modulators
PURX	Power-up reset
PWB	Printed Wiring Board
PWM	Pulse width modulation
RC-filter	Resistance-Capacitance filter
RF	Radio Frequency
RF PopPort™	Reduced function PopPort™ interface
RFBUS	Serial control Bus For RF
RSK	Right Soft Key
RS-MMC	Reduced size Multimedia Card

RSS	Web content Syndication Format
RSSI	Receiving signal strength indicator
RST	Reset Switch
RTC	Real Time Clock (provides date and time)
RX	Radio Receiver
SARAM	Single Access RAM
SAW filter	Surface Acoustic Wave filter
SDRAM	Synchronous Dynamic Random Access Memory
SID	Security ID
SIM	Subscriber Identity Module
SMPS	Switched Mode Power Supply
SNR	Signal-to-noise ratio
SPR	Standard Product requirements
SRAM	Static random access memory
STI	Serial Trace Interface
SW	Software
SWIM	Subscriber/Wallet Identification Module
TCP/IP	Transmission control protocol/Internet protocol
TCXO	Temperature controlled Oscillator
Tiku	Finnish for Chip, Successor of the UPP
TX	Radio Transmitter
UART	Universal asynchronous receiver/transmitter
UEME	Universal Energy Management chip (Enhanced version)
UEMEK	See UEME
UI	User Interface
UPnP	Universal Plug and Play
UPP	Universal Phone Processor
UPP_WD2	Communicator version of DCT4 system ASIC
USB	Universal Serial Bus
VBAT	Battery voltage
VCHAR	Charger voltage
VCO	Voltage controlled oscillator
VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VCXO	Voltage Controlled Crystal Oscillator
Vp-p	Peak-to-peak voltage
VSIM	SIM voltage

WAP	Wireless application protocol
WD	Watchdog
WLAN	Wireless local area network
XHTML	Extensible hypertext markup language
Zocus	Current sensor (used to monitor the current flow to and from the battery)

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